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math instruction

ALGEBRA I

NYS REGENTS REVIEW

TABLE OF CONTENTS

Skill: Order of Operations

Use the order of operations to simplify the following expression.

$$32 - [(5 - 8)^2 + 2(3)]$$

Skill: Evaluating Expressions

Evaluate the expression for the given values.

$\frac{a^2-4b}{2}$ if $a = 4$ and $b = -3$

Regents Practice Questions

Multiple Choice (2pts)

If the expression $4(5) + 6^3 - \frac{10}{2}$ is evaluated, what would be done first?

(1) Adding
(2) Dividing
(3) Cubing
(4) Multiplying

Constructed Response (2 pts)

Michael was given the problem, evaluate $3x^2 - 1$ when $x = -2$. Michael thinks the answer is -13. Is Michael correct? Explain.

Skill: Identifying Properties

Fill in the blank with either the commutative, associative, or distributive property.

a. $-2 + (x + y) = -2 + (y + x)$ _____ property of_____

b. $2 \cdot (x \cdot y) = (2 \cdot x) \cdot y$ _____ property of_____

c. $\frac{15x+30}{3} = 5x + 10$ _____ property over_____

Skill: Distributive Property

Simplify the expression using the distributive property. Combine like terms when needed.

$$-2(3f + 4) - 6(f - 5)$$

Regents Practice Questions

Multiple Choice (2pts)

When Ryan is solving the equation $x^2 + 6(2x - 1) = 4x$, he writes $x^2 + 12x - 6 = 4x$. Which property justifies Ryan's first step?

(1) Associative (3) Commutative

(2) Distributive (4) Addition

Constructed Response (2 pts)

Lily solved the equation $4(2x - 1) - 1 = 11$ for x. Her work is shown to the right.

Between which two lines did Lily make a mistake? Explain which property was used *incorrectly.*

Line 1	$4(2x - 1) - 1 = 11$
Line 2	$4(2x - 1) = 12$
Line 3	$8x - 1 = 12$
Line 4	$8x = 13$
Line 5	$x = \frac{13}{8}$

Skill: Translating Words to Algebra

Translate each of the statements below into algebraic equations.

a. Nine less than "x" is equal to 10_____

b. The quotient of 36 and "a" is 4 _____

c. Twice the sum of f and 6 is 18_____

Skill: Translating Algebra to Words

Directions: Translate each of the equations below into algebraic statements.

a. $3(k + 3) = 9$

b. $4k - 5 = 11$

Regents Practice Questions

Multiple Choice (2pts)

Jenna deposits \$500 into her bank account and withdraws \$50 every week, w. Which of the following expressions represents the amount in Jenna's bank account after w weeks?

(1) $500 \cdot 50w$

(2) $500 - 50w$

(3) $50w - 500$

(4) $\frac{500}{50w}$

Constructed Response (2 pts)

Rachel went to the deli to buy lunch for her and her friends. She bought slices of pizza, soda, and bags of chips. Rachel bought three times as many bags of chips as sodas, and two fewer pizza slices than bags of chips.

If x represents the number of sodas they bought, write an algebraic expression that represents the number of lunch items they bought in total.

Classifying Numbers (Rational vs. Irrational)

Number & Quantity: $2 - 8\%$

Skill: Rational & Irrational Numbers

Identify whether each of the following numbers is rational or irrational.

a. $.\overline{86}$

b. 2.7

c. 2π

d. $\sqrt{169}$

e. $8.54172948\ldots$

f. $\frac{\pi}{3}$

g. $\sqrt{2}$

h. $\frac{3}{4}$

Regents Practice Questions

Multiple Choice (2pts)

1. Which expression results in an irrational number?

(1) $\sqrt{100} - \sqrt{25}$

(2) $\sqrt{36} \cdot \sqrt{1}$

(3) $\sqrt{49} \div \sqrt{1}$

(4) $2\sqrt{2} + \sqrt{81}$

2. Given: $M = \sqrt{4}$ $A = 2\sqrt{10}$ $T = 3\sqrt{14}$ $H = \sqrt{121}$

Which expression results in a rational number?

(1) $M + A$

(2) $A + T$

(3) $T + H$

(4) $H + M$

Constructed Response (2 pts)

A teacher wrote the following set of numbers on the board:

$$a = \sqrt{15} \quad b = 3.1 \quad c = \sqrt{81}$$

Explain why $a + b$ is irrational, but $b + c$ is rational.

Skill: Solving Linear Equations

What is the solution to the equation $\frac{2}{3}\left(x+\frac{6}{5}\right)=5$?

Skill: Solving Linear Equations with Variables on Both Sides

Solve algebraically for x:

$$-\frac{3}{5}(x+10)+\frac{3}{5}x=-\frac{1}{2}x-9$$

Regents Practice Questions

Multiple Choice (2pts)

1. Which value of x makes the equation $\frac{x-2}{3}+\frac{1}{4}=-\frac{5}{12}$ true?

(1) $\frac{5}{2}$ (3) $-\frac{5}{2}$

(2) 0 (4) -1

2. The value of x that satisfies the equation $\frac{2}{3}=\frac{x+9}{15}$ is

(1) 1 (3) 19

(2) -1 (4) -19

Constructed Response (2 pts)

Solve the equation below algebraically for the exact value of x.

$$6-\frac{3}{4}(x+7)=6x$$

Skill: Solving Literal Equations

The formula for the perimeter of a rectangle is $P = 2w + 2l$. Write a formula that can be used to find the length, l, in terms of P, and w.

Skill: Solving Literal Equations with Square Roots

The volume of a right circular cone can be calculated using the formula $V = \frac{1}{3}\pi r^2 h$. Write a formula that can be used to find the positive value for the radius, r, in terms of V and h.

Regents Practice Questions

Multiple Choice (2pts)

Three students were asked to solve the equation $x = 2y - z^2$, for y. Their responses are shown below.

i. $y = x + \frac{z^2}{2}$

ii. $y = \frac{x+z^2}{2}$

iii. $y = \frac{1}{2}(x + z^2)$

Which response(s) are correctly solved for y?

(1) i. only

(2) i. and ii.

(3) i., ii., and iii.

(4) ii. and iii.

Constructed Response (2 pts)

The formula for converting degrees Fahrenheit, F to degrees Kelvin, K is:

$$K = \frac{5}{9}(459.67 + F)$$

Solve for F in terms of K.

Consecutive Integers

Algebra: $50 - 56\%$

Skill: Consecutive Integers

If n is an integer, which equation can be used to find three consecutive integers whose sum is -18.

(1) $n + (n + 1) + (n + 3) = -18$

(2) $n + (n + 1) + (n + 2) = -18$

(3) $n + (n + 2) + (n + 4) = -18$

(4) $n + (n + 2) + (n + 3) = -18$

Skill: Consecutive Even & Odd Integers

The sum of three consecutive odd integers is 13 less than 4 times the middle number. Find the three integers. Only an algebraic solution can receive full credit.

Regents Practice Questions

Multiple Choice (2pts)

Michelle and Patrick's ages are consecutive integers. Michelle is younger than Patrick and Patrick's age is represented by x. If the difference of the square of Patrick's age and three times Michelle's age is 73, which equation could be used to find Patrick's age?

(1) $(x + 1)^2 - 3x = 73$

(2) $x^2 - 3(x + 1) = 73$

(3) $(x - 1)^2 - 3x = 73$

(4) $x^2 - 3(x - 1) = 73$

Constructed Response (2 pts)

The sum of the ages of three sisters is 63. If their ages are consecutive integers, what is the age of the middle sister?

Skill: Modeling Linear Word Problems

The Algebra teachers at Blue Field High School need to buy new textbooks and calculators for the math department. The textbooks cost $105.00 each, and the calculators cost $120.00 each. If the teachers have $4,000 to spend and purchase 25 calculators, how many textbooks can they buy?

(1) 9

(2) 10

(3) 11

(4) 12

Regents Practice Questions

Multiple Choice (2 pts)

1. Damian's soccer team is purchasing t-shirts. The company charges $150 for a one-time set-up fee and $22 for each printed t-shirt. Which expression represents the total cost of x number of t-shirts for the team?

   (1) $22x$

   (2) $22 + 150x$

   (3) $22x + 150$

   (4) $22(x + 150)$

2. Akari is four years older than twice her sister Keira's age. The sum of their ages is 10. If Keira's age is represented by k, which expression represents the sum of their ages?

   (1) $k + (6k) = 10$

   (2) $2k + 4 = 10$

   (3) $k + (2k + 4) = 10$

   (4) $k \cdot (2k + 4) = 10$

Constructed Response (2 pts)

Tina buys tickets to an amusement park. Adult tickets cost $18.50 each and children tickets cost $12.25 each. Tina has $280 to purchase both adult and children's tickets. If she purchases 6 children's tickets, determine algebraically the maximum number of adult tickets that Tina can purchase.

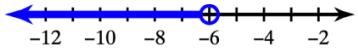
Skill: Truth Values

Determine whether each of the values for x below are solutions to the inequality: $-8(6+8x) > -496$.

a. $x = 7$ b. $x = -3$ c. $x = 10$

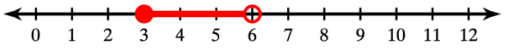
Skill: Number Lines

Write an inequality in terms of x that represents the solution on the number line and express in interval notation.



Inequality: _____

Interval Notation: _____



Inequality: _____

Interval Notation: _____

Regents Practice Questions

Multiple Choice (2pts)

1. Which of the following values for n makes the inequality $6n - 29 > 5(-7+n)$ true?

(1) 0 (3) -7

(2) -6 (4) -10

2. Which notation is equivalent to the inequality $-5 \leq x < 8$?

(1) $(-5,8)$ (3) $[-5,8)$

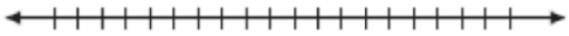
(2) $[-5,8]$ (4) $(-5,8]$

Constructed Response (2 pts)

For a person to ride a rollercoaster they must be at least 48 inches tall but no more than 84 inches tall.

a. Express the height requirement, h, for the rollercoaster in interval notation.

b. Graph the inequality that represents the height requirement.



Skill: Solving Linear Inequalities

Solve the inequality below for the given variable.

$$21 - 6x \leq -3(8 + 6x) - 3x$$

Is $x = 0$ a solution? Justify your answer.

Skill: Inequalities with Fractions

Solve the inequality below for the given variable.

$$\frac{3}{2}p - \frac{5}{3} < p - \frac{17}{12}$$

State the largest integer solution.

Regents Practice Questions

Multiple Choice (2pts)

Which of the following is a solution to the linear inequality $-(4 - 3x) > -19 + 6x$?

(1) $x = 10$ (3) $x = 5$

(2) $x = 6$ (4) $x = -1$

Constructed Response (2 pts)

Solve the inequality below to determine and state the **smallest possible value** for x in the solution set.

$$1 + 2.6x < 3.9x + 10.88$$

Skill: Writing and Solving Linear Inequalities

You and your friends go to the diner and order burgers and drinks. Each burger costs \$8.00 and one soda costs \$2.50. Combined, you and your friends order twice as many burgers as you do sodas, s.

a. Write an algebraic expression that represents the number of hotdogs you and your friends want to buy.

# of sodas: s

# of burgers: _____

b. Combined, you and your friends can spend no more than a \$100 gift card. Write an inequality that represents the number of burgers and sodas you and your friends can buy.

c. Solve your inequality from part b. and state the maximum number of sodas that can be purchased.

Regents Practice Questions

Multiple Choice (2pts)

Michael orders his employees new t-shirts and hats. T-shirts cost \$15 per shirt and hats cost \$5 per hat. If he only has \$300 to spend on apparel, which inequality represents the situation where he buys x shirts and y hats?

(1) $15y + 5x \leq 300$

(2) $15y + 5x \geq 300$

(3) $15x + 5y \leq 300$

(4) $15x + 5y \geq 300$

Constructed Response (4 pts)

Two high schools are hosting a carnival to raise money. Highschool A charges an \$11 entry fee and \$5 per ride. Highschool B charges a \$15 entry fee and \$3 per ride.

a. Write an expression for Highschool A that could be used to determine the total cost, where x is the number of rides.

b. Write a second expression for Highschool B that could be used to determine the total cost, where x is the number of rides.

c. Determine algebraically and state the maximum number of rides that a person must go on for it to be cheaper to attend Highschool A's carnival.

Skill: Identifying Functions

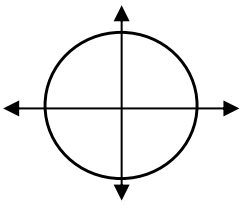
1. **Fill in the blank.**

   A function assigns at most _____ output to every input and passes the _____ line test.

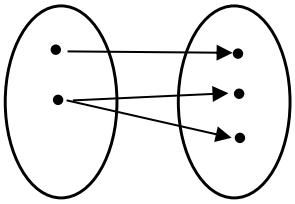
2. Identify whether each of the following relations represents a function.

   a. $\{(-2,1),(-1,1),(0,1),(1,1)\}$

   b.



   c.

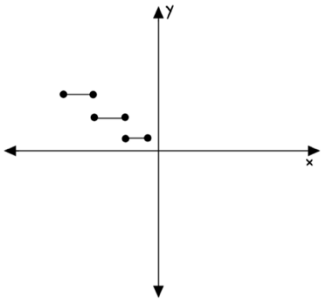


Regents Practice Questions

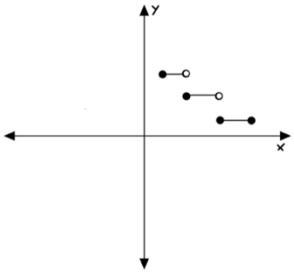
Multiple Choice (2pts)

Which graph represents a relation that is *not* a function?

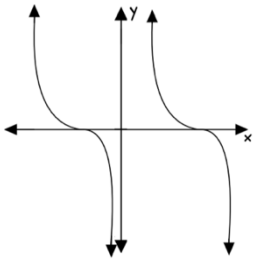
(1)



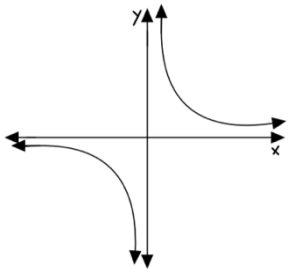
(3)



(2)



(4)



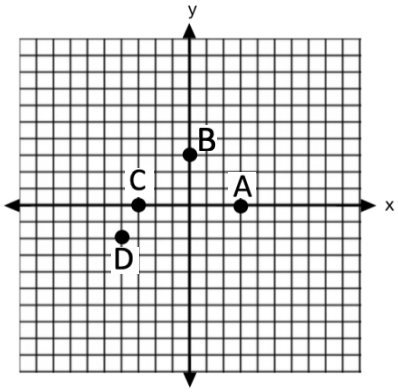
Constructed Response (2 pts)

A function is shown in the table below. If included in the table, which ordered pair, $(-2,3)$ or $(3,-2)$, would result in a relation that no longer represents a function? Explain your answer.

x	$f(x)$
-2	0
0	3
1	-4
2	-3

Skill: Evaluating Functions Given a Graph, Table, and Equation

1. The graph of $y = g(x)$ is shown below.



Which point could be used to find $g(3)$?

(1) A
(2) B
(3) C
(4) D

2. The function $f(x)$ is shown below in the table.

x	-1	0	1	2
$f(x)$	2	3	4	5

Which of the following is the correct value of $f(2)$?

(1) -1
(2) 3
(3) 5
(4) 0

3. The height, $h(x)$, of a bouncing basketball after x bounces is represented by the function $h(x) = 27\left(\frac{1}{3}\right)^x$. How many times higher is the first bounce than the third bounce?

(1) 3
(2) 9
(3) 8
(4) 2

Regents Practice Questions

Multiple Choice (2pts)

The function $f(x)$ is defined as $f(x) = -3x^2 + 2x$. The value of $f(-2)$ is

(1) -16
(2) -8
(3) 8
(4) 16

Constructed Response (2 pts)

Miranda and Nicole were asked to evaluate $g(4)$, where $g(x) = 3x^2 - 4\sqrt{x}$. Miranda got a value of 40 and Nicole got a value of 16. Who is correct? Explain.

Skill: Definitions & Terminology

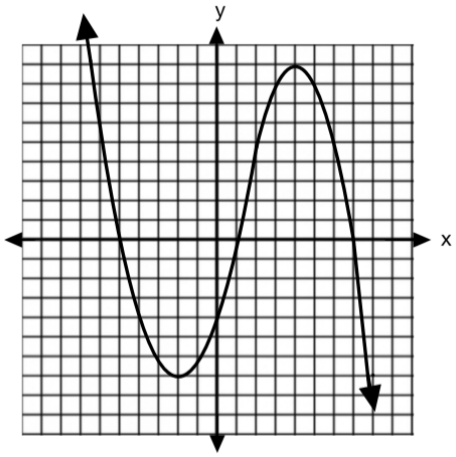
Fill in the blank.

1. The **y-intercept** is a point where a function or relation crosses the _____ axis and is always at _____ $= 0$.

2. The **x-intercepts** are points where a function or relation crosses the _____ axis and are always at _____ $= 0$. x-intercepts are also called _____ or roots.

Skill: Key Features of Graphs

Given the graph of $f(x)$ below, identify the following.



a. Y intercept

b. X-intercept(s)

c. Increasing Interval

d. Decreasing Interval

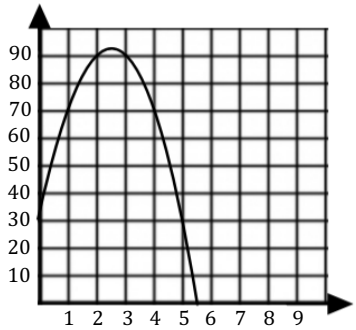
e. Interval where $f(x) > 0$

f. Interval where $f(x) < 0$

Regents Practice Questions

Multiple Choice (2pts)

1. A golf ball is hit into the air off a 30 foot high hill out onto the green. The graph below models the golf ball's height, y, in feet from the ground x seconds after it was hit.



For which interval is the ball's height always *decreasing*?

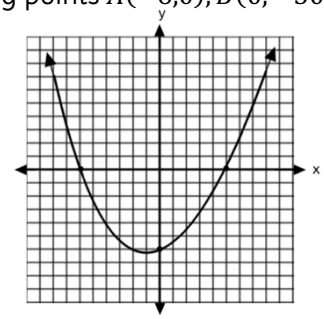
(1) $0 < x < 2.5$

(2) $0 < x < 5.5$

(3) $2.5 < x < 5.5$

(4) $2 < x < 5.5$

2. The graph of $y = x^2 + x - 30$ is shown below containing points $A(-6,0), B(0,-30)$, and $C(5,0)$.



Which of these points can determine the zeroes of $y = x^2 + x - 30$?

(1) A only

(2) A and B

(3) B only

(4) A and C

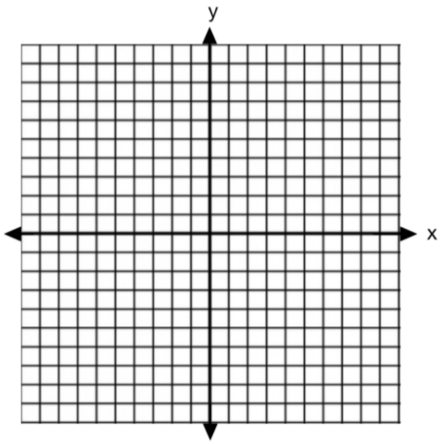
Skill: Definitions & Terminology

Fill in the blank.

- The **domain** of a function or relation is the set of all _____ values or "x-values" over which a function/relation is defined.
- The **range** of a function or relation is the set of all "y-values" the function/relation takes on as _____.

Skill: Domain & Range from a Graph

Graph the absolute value equation $y = |x - 1| + 3$ on the set of axes to the right, then find the following.



a. State the domain in interval notation.

b. State the range in set-builder notation.

Regents Practice Questions

Multiple Choice (2pts)

1. What is the domain of the relation shown below?

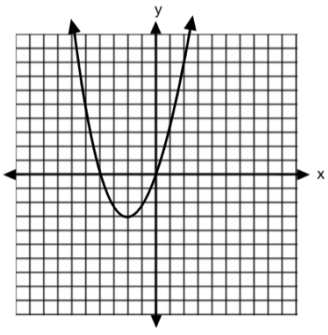
   $\{(-3,1), (-2,3), (-1,5), (-2,3), (-1,4)\}$

   (1) $\{-3, -2, -1\}$
   (2) $\{1,3,4,5\}$
   (3) $\{1,3,4,5, -2\}$
   (4) $\{-3, -2, -2, -1, -1, 4, 4\}$

2. Let $f(x) = 2x^2 - 1$ be a function defined on the domain $-1 \leq x \leq 3$. The range of this function is

   (1) $\{-3, -1, 1, 7, 17\}$
   (2) $\{1, -1, 7, 17\}$
   (3) $\{-1, 0, 1, 2, 3\}$
   (4) $\{4, -1, 3, 15, 35\}$

3. What is the domain of the function shown graphed below?



   (1) All real numbers
   (2) All positive real numbers
   (3) $-3 \leq x < \infty$
   (4) $x > 0$

Skill: Definitions & Terminology

What is the formula used to find the average rate of change?

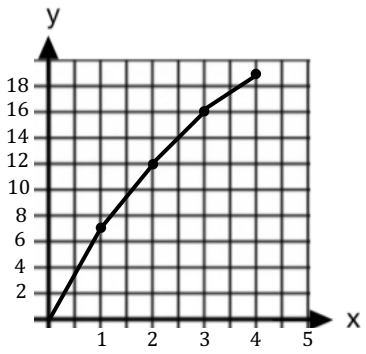
Skill: Calculating Average Rate of Change

Find the average rate of change of the function $f(x) = 2(3)^x$ over the interval $2 \leq x \leq 5$.

Regents Practice Questions

Multiple Choice (2pts)

The graph below shows the distance in miles, x , Jeremy ran during the NYC marathon in hours, h.



Which hourly interval has the greatest average rate of change?

(1) hour 0 to hour 1

(2) hour 1 to hour 2

(3) hour 2 to hour 3

(4) hour 3 to hour 4

Constructed Response (2 pts)

The table below represents the height of a tennis ball above the ground in feet, $h(t)$, after being hit with t representing time in seconds.

t	$h(t)$
0	7.3
1	6.72
2	6
3	3.82

Calculate the average rate of change from 1 to 3 seconds, in feet per second. Round to the nearest tenth.

Skill: Evaluating Linear Functions

Evaluate the function $f(x) = \frac{1}{3}x + 5$ at the given values:

a. $f(3)$ b. $f(0)$ c. $f(-12)$

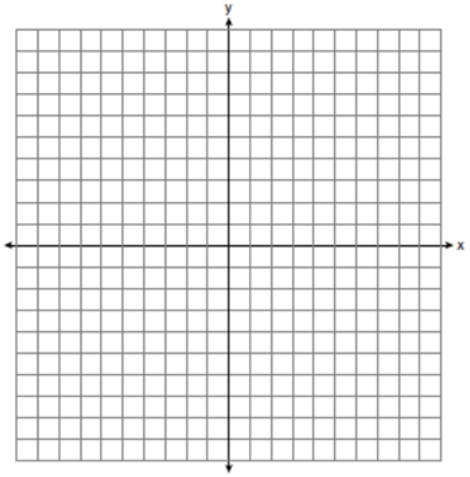
d. Which of the following above represents the y-intercept? Explain.

Skill: Graphing Linear Functions

a. Write the linear equation $3y + 2x = 1$ in slope intercept form, then identify the slope and y-intercept.

slope: y-intercept:

b. Graph the linear equation on the axes to the right.



Regents Practice Questions

Multiple Choice (2pts)

1. Which of the following is true about the linear function $4 - y = 8x$?

(1) It has a slope of 4 and a y-intercept of 8
(2) It has a slope of -8 and a y-intercept of 4
(3) It has a slope of -8 and a y-intercept of -4
(4) It has a slope of 4 and a y-intercept of -8

2. If $f(x) = -2x + 4$, what is the value of $f\left(-\frac{1}{2}\right)$?

(1) 4 (3) 3
(2) 2 (4) 5

Constructed Response (2 pts)

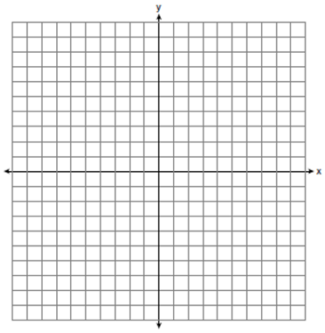
Point $(k, -2)$ lies on the line whose equation is $3y = 4x - 7$. Determine the value of k.

Skill: Writing Linear Equations from Two Points

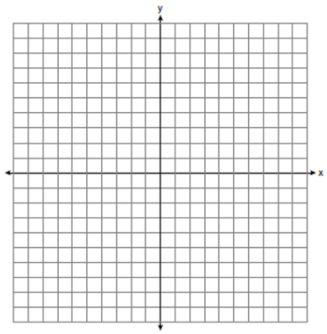
Write the equation of a line passing through the points $(0,10)$ and $(2,40)$.

Skill: Horizontal & Vertical Lines

a. Write an equation of a vertical line passing through the point $(-3,6)$ and graph the line, then identify the slope.



b. Write an equation of a horizontal line passing through the point $(5,4)$ and graph the line, then identify the slope.



Regents Practice Questions

Multiple Choice (2pts)

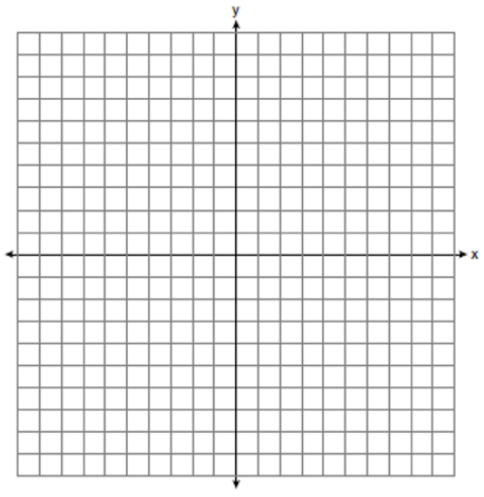
Which of the following represents a line passing through the points $(4,-2)$ and $(5,5)$?

(1) $y = -7x - 30$ (3) $y = -30x - 7$

(2) $y = 7x - 30$ (4) $y = -5x - 30$

Constructed Response (4 pts)

On the set of axes, graph the line whose equation is $3y = -3x + 6$.



This linear equation contains the point $(2,k)$. State the value of k.

Skill: Writing Equations from Context

Tony attends a baseball game and wants to treat his friends to food and drinks. Hotdogs cost \$4 each and iced teas costs \$1.50 each. Tony has a total of \$25 to spend on him and his four friends.

a. Write an equation using x, the number of hotdogs, and y, the number of iced teas that Tony can buy for him and his friends.

b. If Tony and his friends each get one hotdog, find the maximum number of iced teas they can buy.

Regents Practice Questions

Multiple Choice (2pts)

A cell phone company charges a flat fee of \$65 a month for the service and \$0.10 per text message sent. If $C(x)$ represents the total cost after sending x, amount of text messages, which of the equations below can be used to determine the total cost after one month?

(1) $C(x) = 65x + 0.10$ (3) $C(x) = 65.1x$

(2) $C(x) = 0.10x + 65$ (4) $C(x) = .10x - 65$

Constructed Response (4 pts)

The table below represents the number of hours a student worked babysitting and the amount of money the student earned.

Hours worked (x)	Amount earned (y)
4	\$46.00
10	\$115.00
15	\$172.50
27	\$310.50

Write an equation that represents the number of dollars, y, earned in terms of the number of hours, x, worked.

Using this equation, determine the number of dollars the student would earn for babysitting for 22 hours.

Skill: Evaluate Piecewise Linear Functions

Given the piecewise linear function below, evaluate each of the following algebraically.

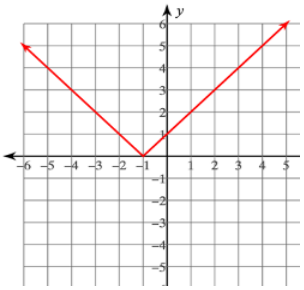
$$f(x) = \begin{cases} 2x - 1, & -4 \leq x < -1 \\ 2, & -1 \leq x < 3 \\ \frac{1}{3}x + 4, & x \geq 3 \end{cases}$$

a. $f(-3)$ b. $f(-1)$ c. $f(0)$ d. $f(3)$

Regents Practice Questions

Multiple Choice (2pts)

Which equation represents the function shown in the accompanying graph?



(1) $f(x) = |x| + 1$

(2) $f(x) = |x| - 1$

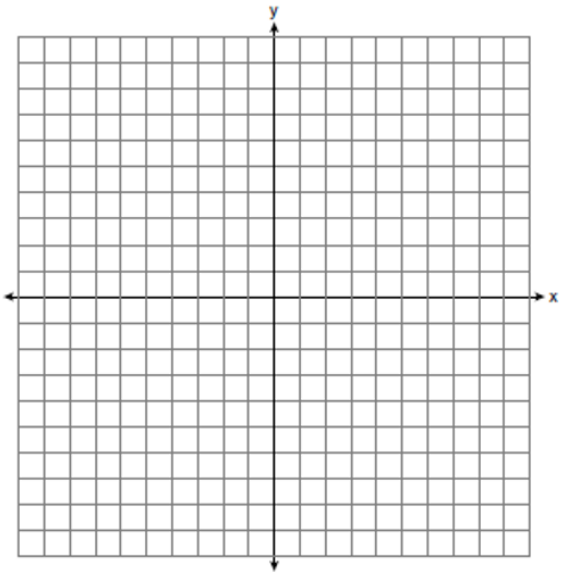
(3) $f(x) = |x + 1|$

(4) $f(x) = |x - 1|$

Constructed Response (4 pts)

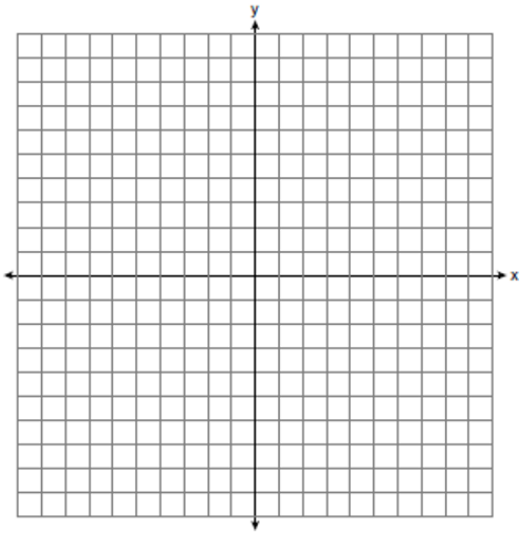
Graph the following piecewise function on the set of axes below

$$f(x) = \begin{cases} |x| & -4 \leq x < 1 \\ -x + 6 & 1 \leq x \leq 5 \end{cases}$$



Skill: Writing & Solving Linear Inequalities

Graph the linear inequality $-2y - 10 > -4x$.



a. State a point in the solution set.

b. State a point not in the solution set.

c. Is the point $(0, -5)$ in the solution set? Explain.

Regents Practice Questions

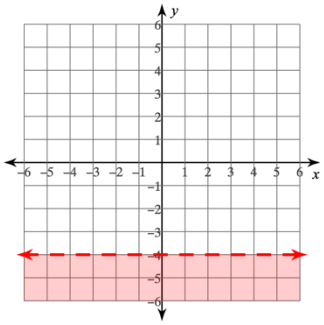
Multiple Choice (2pts)

1. Which ordered pair is **not** in the solution set of $3y \geq 4x - 4$?

(1) $(1, 2)$ (3) $(0,0)$

(2) $(0, 5)$ (4) $(3, 1)$

2. Which inequality is represented by the graph shown below?



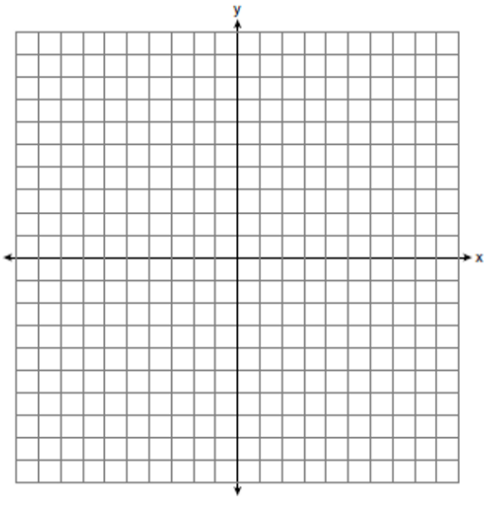
(1) $y \leq -4$ (3) $y < -4$

(2) $x < -4$ (4) $x \leq -4$

Constructed Response (4 pts)

On the set of axes, graph the inequality:

$$3x - 3y \geq -6$$

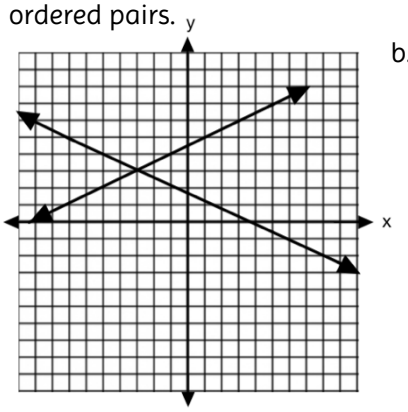


Is the point $(1, 2)$ in the solution set? Justify your answer.

Skill: Solving Systems Graphically

1. To solve a system of linear equations graphically, write both equations in slope intercept form and graph the functions. Then find the _____ point(s).

2. Find the solution(s) to each of the systems of equations shown below. State the solutions as ordered pairs.

a. 

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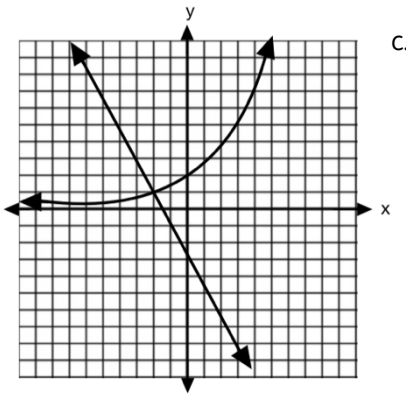
b. 

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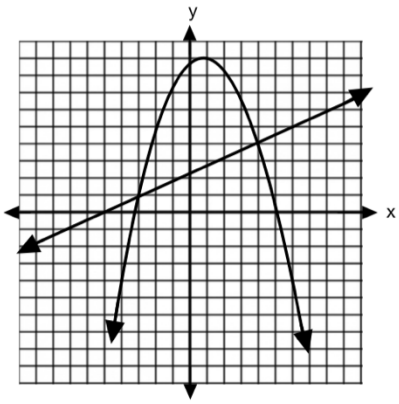
c. 

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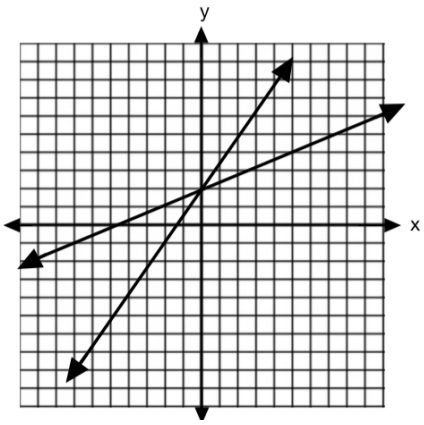
Regents Practice Questions

Multiple Choice (2 points)

What is the solution to the system of equations shown in the graph?



(1) $(2,0)$

(2) $(0,2)$

(3) $(-1,0)$

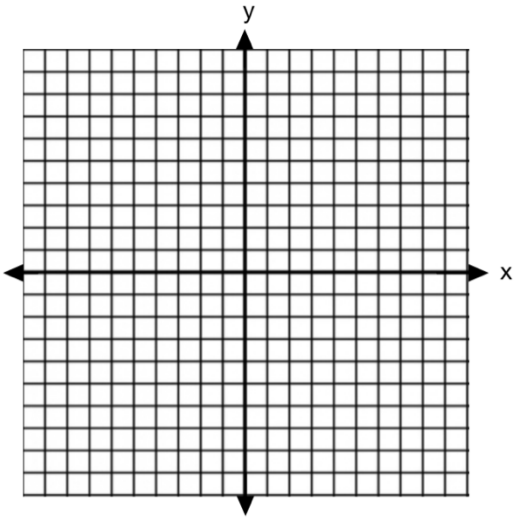
(4) $(-4,0)$

Constructed Response (4 points)

On the set of axes below, solve the following systems of equations graphically. State the coordinates of the solution.

$$y = x - 4$$

$$y - 3x = 6$$



Skill: Solving Systems Using Substitution

Solve the system of linear equations below using the substitution method.

$$y = x + 4$$
$$24 = 6(-2x + y)$$

Regents Practice Questions

Multiple Choice (2 points)

1. Using the substitution method, Eli solves the following system of equations algebraically.

$$2x - y = 4$$
$$5x - 7y = -12$$

Which equivalent equation could Eli use?

(1) $5x - 7(2x - 4) = -12$
(2) $5x - 7(-2x - 4) = -12$
(3) $5(2y + 2) - 7y = -12$
(4) $5\left(\frac{1}{2}y - 2\right) - 7y = -12$

2. Using the substitution method, Gordon solves the system below algebraically:

$$5x + 2y = -1$$
$$3x - y = 6$$

Which of the following equations could Gordon use?

(1) $5\left(\frac{1}{3}y - 2\right) + 2y = -1$
(2) $5(3y + 2) + 2y = -1$
(3) $5x + 2(3x - 6) = -1$
(4) $5x + 2(-3x + 6) = -1$

Constructed Response (4 points)

What is the solution of the system of equations $x = 4y - 6$ and $3y + x = 8$? Solve *algebraically*.

Skill: Solving Systems Using Elimination

Solve the system of equations below *algebraically* using the method of elimination.

$$2x + 3y = 12$$
$$6x - 5y = 8$$

Regents Practice Questions

Multiple Choice (2 points)

1. A system of equations is shown below.

$$\text{Equation } A\text{: } 5x + 8y = 12$$
$$\text{Equation } B\text{: } 3x - 4y = 8$$

Which method eliminates one of the variables?

(1) Multiply equation A by $-\frac{1}{2}$ and add the results to equation B.

(2) Multiply equation B by 2 and add the results to equation A.

(3) Multiply equation A by 2 and equation B by -4 and add the results together.

(4) Multiply equation B by 5 and equation A by 3 and add the results together.

2. What is the value of the y-coordinate of the solution to the system of equations $x - 4y = 2$ and $x + 8y = 26$?

(1) 0

(2) -2

(3) 1

(4) 2

Constructed Response (4 points)

Solve the system of linear equations below using elimination.

$$3x - y = 7$$
$$x + y = 2$$

Skill: Modeling Systems of Linear Equations (Coin)

Dexter has been collecting spare coins for over a month. He brings his collection to the bank and drops them into a machine that counts the total number of coins. Once finished, the machine counts that Dexter has 362 coins with a value of $68.15.

If Dexter only collects dimes and quarters, write a system of equations in two variables or an equation in one variable that could be used to model this situation, where d is the number of dimes and q is the number of quarters.

Using your system of equations or single equation, algebraically determine the number of dimes Dexter had collected.

Regents Practice Questions

Constructed Response (6 points)

1. Two friends, Christian and Wendy, went to a football game. Christian bought 2 churros and 3 cookies and spent a total of $16.25 without sales tax. Wendy bought one churro and 5 cookies and spent a total of $21.25 without sales tax.

   Using x for the cost of a churro and y for the cost of a cookie, write a system of equations that models this situation.

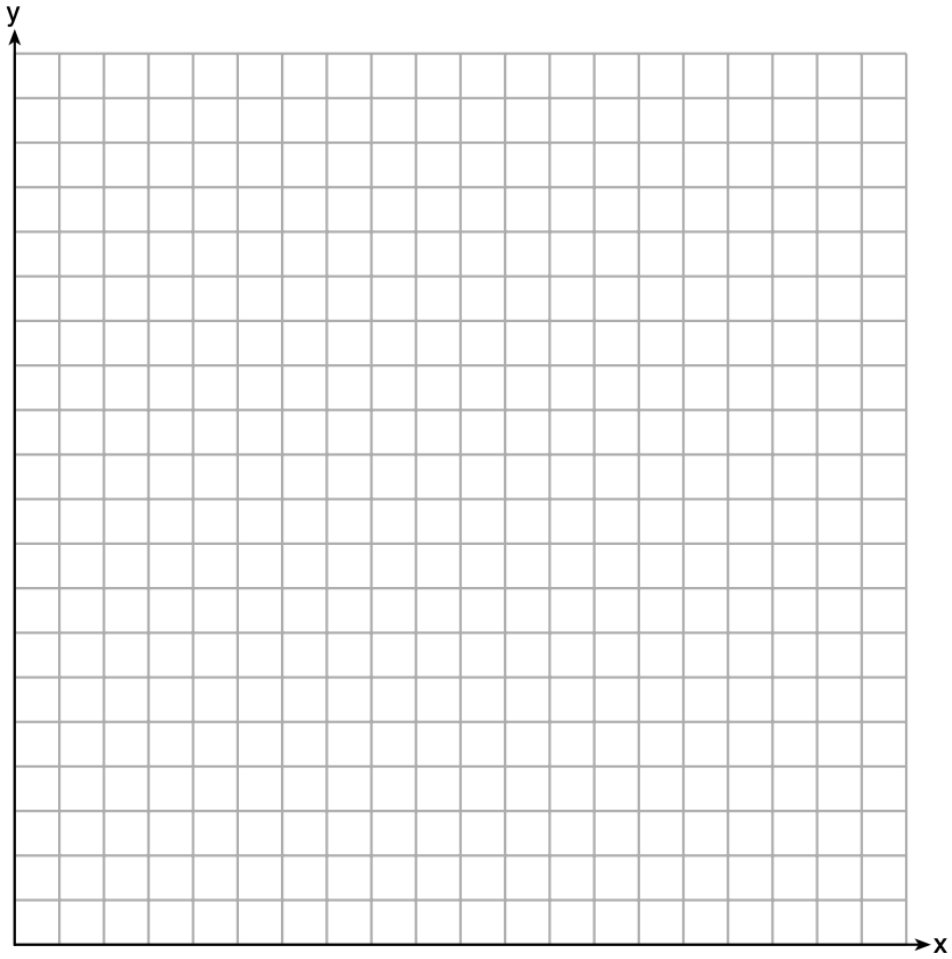
   Wendy said that since her bill was $21.25 , each churro cost $2.25 and each cookie cost $3.25. Is she correct? Justify your answer.

   Using your equations, algebraically determine the cost of one churro and the cost of one cookie.

2. Eastern Middle School had 3 members in their homework club in 2020. Over the years, the club has grown by an average of 2 members per year. The same school had 8 members in their art club in 2020 and saw an increase of 1 member per year.

   Write a system of equations to model this situation, where x represents the number of years since 2020.

   Graph this system of equations on the axes below.

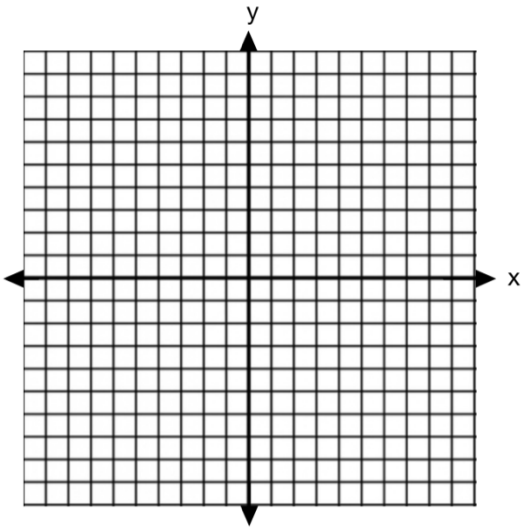


   Explain in detail what each value of the intersection point of these equations means in terms of the context of the problem.

Skill: Graphing Systems of Linear Inequalities

Graph the system of inequalities on the set of axes below:

$$y \leq -\frac{2}{3}x + 4$$
$$x - 3y > 6$$

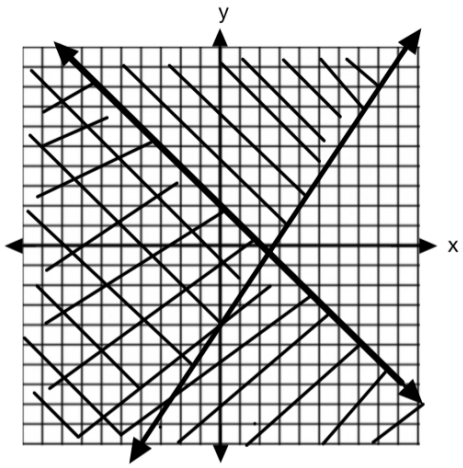


Is the point $(0, -2)$ in the solution set? Explain your answer.

Regents Practice Questions

Multiple Choice (2 points)

1. Which of the following systems of inequalities is represented by the graph shown below?



(1) $y \geq \frac{3}{2}x - 4$
$y \leq -x + 2$

(2) $y \leq \frac{3}{2}x - 4$
$y \leq \frac{3}{2}x - 4$

(3) $y > \frac{3}{2}x - 4$
$y \leq -x + 2$

(4) $y < \frac{3}{2}x + 4$
$y \geq \frac{3}{2}x - 4$

2. Which point is a solution to the system below?

$$3y < -10x + 4$$
$$y < -6x + 2$$

(1) $(0,1)$

(2) $(3, -1)$

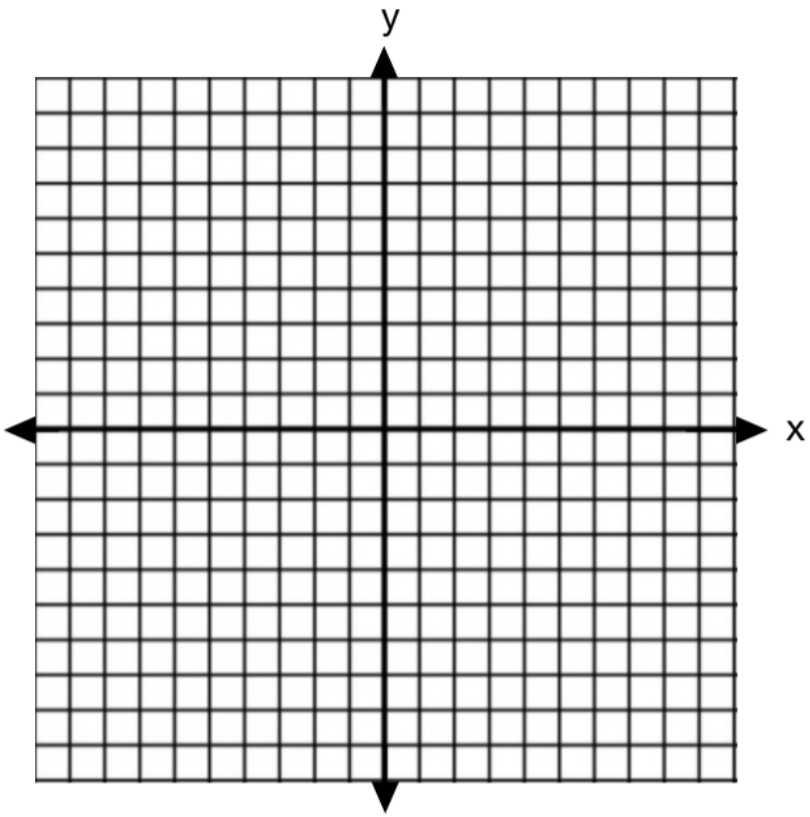
(3) $\left(\frac{1}{2}, 4\right)$

(4) $\left(\frac{3}{2}, -4\right)$

Constructed Response (4 points)

Graph the following systems of inequalities on the set of axes below:

$$2y \geq 3x - 12$$
$$y + 2x > -4$$



Based upon your graph, explain why $(0,0)$ is a solution to this system and why $(-3,2)$ is not.

Skill: Modeling Systems of Linear Inequalities

Shanira is selling bottles of homemade vanilla extract and handmade soaps on her online store. She wants to sell at least $\$450$ worth of bottles of vanilla extract and soaps per day. Each bottle of vanilla costs $\$15$ and each soap costs $\$12$. Shanira can sell a maximum of 40 items per day. Write a system of inequalities that models these constraints.

Regents Practice Questions

Multiple Choice (2 points)

Xavier works two jobs as a landscaper and lifeguard over the summer. He is paid $\$18$ per hour for mowing lawns and $\$32$ per hour lifeguarding. He can work a maximum of 40 hours per week and hopes to earn at least $\$720$. If m represents the number of hours mowing lawns and l represents the number of hours lifeguarding, which system of inequalities could be used to represent the given conditions?

(1) $m + l > 40$
$18m + 32l \geq 720$

(2) $m + l \leq 40$
$18m + 32l \leq 720$

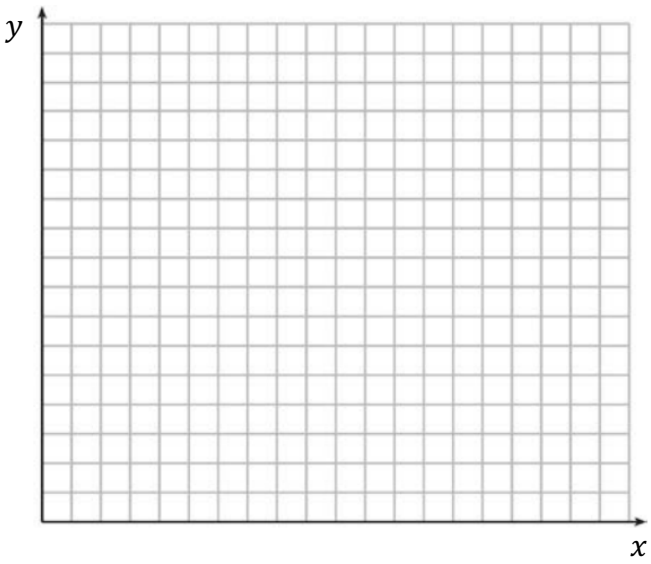
(3) $m + l \leq 40$
$18m + 32l \geq 720$

(4) $m + l > 40$
$18m + 32l < 720$

Constructed Response (4 points)

Maurice works at a restaurant x hours a week after school and gets paid $\$12$ an hour. He also works as a babysitter y hours a week and earns $\$8$ per hour. Maurice can work no more than 14 hours a week, due to school commitments. He wants to earn at least $\$72$ a week working both jobs.

Write a system of linear inequalities that can be used to represent the situation. Graph these inequalities on the set of axes provided.



Determine and state one combination of hours that will allow Maurice to earn at least $\$72$ per week.

Skill: Definitions & Terminology

Product Rule: $z^x \cdot z^y =$

Quotient Rule: $\frac{z^x}{z^y} =$

Zero Power Rule: $z^0 =$

Power to a Power Rule: $(x^a)^b =$

Extended Power Rule (Multiplication): $(xy)^b =$

Extended Power Rule (Division): $\left(\frac{x}{y}\right)^b =$

Negative Exponents: $x^{-a} =$

Skill: Exponent Rules

Simplify each expression below. Be sure your final answer contains positive exponents.

a. $(x^3)^5 \cdot 2x^4$

b. $\frac{18c^5}{9c^8}$

c. $\left(\frac{1}{2}x^6\right)^2$

d. $\frac{3a^7b^4c^2}{15a^2b^3c}$

e. 6^{x+2}

f. $(3x^{-5})^3 \cdot 2x^4$

Regents Practice Questions

Multiple Choice (2 points)

1. The expression $(3x^3y^2)^4$ is equivalent to

   (1) $16x^{16}y^{12}$ (3) $4y^2x^6$

   (2) $81x^{12}y^8$ (4) $27x^3y^{12}$

2. Which of the following is equivalent to 3^{x+2}?

   (1) $3^x + 9$ (3) 27^x

   (2) $3^x - 9$ (4) $9(3)^x$

Constructed Response (2 points)

Simplify: $\frac{36a^5b^8}{(4a)(9b^2)}$

Skill: Growth vs. Decay

$$y = a(b)^x$$

Given the following exponential functions, determine whether they represent growth or decay and state the y-intercept as an ordered pair.

a. $f(x) = \frac{1}{3}(4.2)^x$

b. $y = 5(.05)^x$

c. $G(t) = 1.2\left(\frac{9}{2}\right)^t$

Skill: Writing Exponential Functions

1. Given the table below, determine the following:

a. y-intercept (a): _____

b. Multiplier (b): _____

c. Equation $y = a(b)^x$:

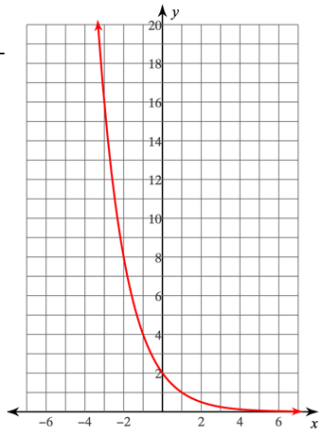
x	$f(x)$
-3	0.5
-2	1
-1	2
0	4
1	8

2. Given the graph below, determine the following:

a. y-intercept (a): _____

b. Multiplier (b): _____

c. Equation $y = a(b)^x$:



Regents Practice Questions

Multiple Choice (2 points)

Michael is comparing the graphs of $y = 2^x$ and $y = 4^x$. Which statement is true?

(1) The y-intercept of $y = 2^x$ is $(0,2)$ and the y-intercept of $y = 4^x$ is $(0,4)$.

(2) Neither graph has a y-intercept.

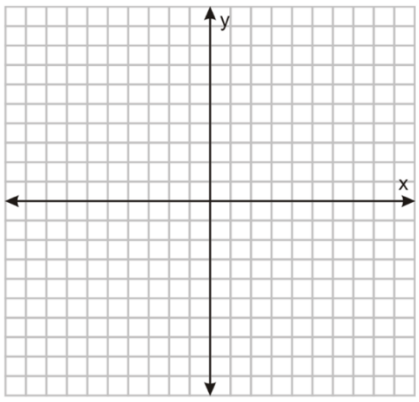
(3) Both graphs have a y-intercept of $(0,1)$ and $y = 4^x$is steeper.

(4) Both graphs have a y-intercept of $(0,1)$ and $y = 2^x$is steeper.

Constructed Response (4 points)

Graph the function $f(x) = 2^x - 3$ on the axes provided.

If $g(x) = \frac{1}{2}x - 3$, determine if $f(x) > g(x)$ when $x = 2$. Justify your answer below.



Skill: Conversions

1. Convert each decimal into a percent.

a. 0.28

b. 3.26

2. Convert each percent into a decimal.

a. 22%

b. 8.4%

Skill: Identifying Growth & Decay

Given each exponential function, determine the following:

1. $j(x) = \frac{1}{2}(0.67)^x$

Growth or Decay: _____

_____ = _____ − _____
b r

% change= _____

2.

Growth or Decay: _____

_____ = _____ + _____
b r

% change= _____

x	y
0	3
1	6
2	12
3	24

Regents Practice Questions

Growth: $y = a(1 + r)^x$ Decay: $y = a(1 - r)^x$

Multiple Choice (2 points)

1. A culture of bacteria begins with 1000 cells which die at a rate of 40% each year, x. Which equation represents this situation?

(1) $y = 1000(.40)^x$ (3) $y = 1000(.60)^x$

(2) $y = 1000(1.40)^x$ (4) $y = 1000(40)^x$

2. Alex invests $\$5{,}200$ into his bank account which earns 2% interest each year. How much will Alex have in his bank account after 5 years?

(1) $\$12{,}939.26$ (3) $\$1{,}703.93$

(2) $\$5{,}741.22$ (4) $\$4{,}700.39$

Constructed Response (4 points)

The value of a house is expected to increase from its current value of $\$100{,}000$ by 3.5% each year. What will the value of the house be after 6 years?

If you have $\$30{,}000$ in 6 years, will you have enough money to put down 20% of the houses value?

Skill: Linear vs. Exponential

Determine whether each of the following tables represents a linear or exponential function. Then write the equation that represents the function.

a.
Linear or Exponential?

_____

Equation:

_____

x	y
-1	-5
0	-3
1	-1
2	1

b.
Linear or Exponential?

_____

Equation:

_____

x	y
-1	¼
0	1
1	4
2	16
3	64

Skill: Writing Linear & Exponential Functions

Consider the two points $(0,6)$ and $(1,18)$.

a. Write a **linear equation** of the form $f(x) = mx + b$ that goes through the two points above.

b. Write an **exponential equation** of the form $g(x) = a(b)^x$ that goes through the two points above.

Regents Practice Questions

Multiple Choice (2 points)

1. Which equation models the data in the accompanying table?

Time (hours), x	-1	0	1	2	3
Population, y	$\frac{8}{3}$	8	24	72	216

(1) $y = 8x + 3$

(2) $y = 3x + 8$

(3) $y = 8(3)^x$

(4) $y = 3(8)^x$

2. If a population of 50 birds doubles every month, which function represents $p(t)$, the population after m months?

(1) $p(t) = 50(2)^m$

(2) $p(t) = 3m + 50$

(3) $p(t) = 2(50)^m$

(4) $p(t) = 50m + 3$

Skill: Definitions & Terminology

Transformations of Functions: $f(x)$		
Vertical	**Up**	$f(x)+k$ shifts $f(x)$ up k units.
	Down	$f(x)-k$ shifts $f(x)$ down k units.
Horizontal	**Right**	$f(x-h)$ shifts $f(x)$ right h units.
	Left	$f(x+h)$ shifts $f(x)$ left h units.
Reflection	**x-axis**	$-f(x)$ reflects $f(x)$ over the x-axis.
	y-axis	$f(-x)$ reflects $f(x)$ over the y-axis.
Vertical	**Stretch**	$a \cdot f(x)$, where $a > 1$, stretches $f(x)$ vertically by a factor of a.
	Shrink	$a \cdot f(x)$, where $0 < a < 1$, shrinks $f(x)$ vertically by a factor of a.

Regents Practice Questions

Multiple Choice (2 points)

1. Compared to the graph of $f(x) = 3^x$, the graph of $g(x) = 3^{x+2} - 4$ is the result of translating:

   (1) 4 units left, 2 units up
   (2) 2 units right, 4 units down
   (3) 4 units right, 2 units up
   (4) 2 units left, 4 units down

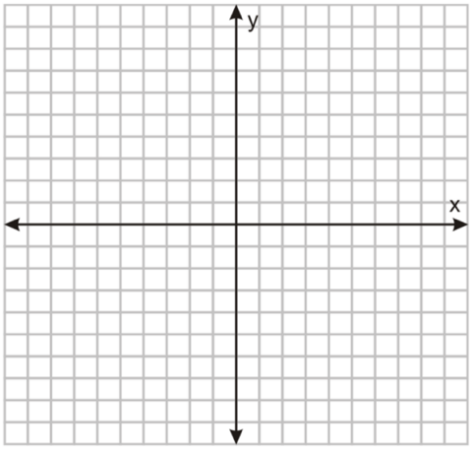
2. When the function $f(x) = 2^x$ is multiplied by the value a, where $a > 1$, the new function $g(x) = a(2)^x$:

   (1) Compresses vertically by a factor of a
   (2) Reflects over the x-axis
   (3) Stretches vertically by a factor of a
   (4) Reflects over the y-axis

Constructed Response (2 points)

1. Describe the transformation applied to the graph of $g(x) = 2^x$ that forms the new function $h(x) = 2^{x+1} - 5$.

2. On the axes below, graph the function $y = 2^x - 4$. Describe the transformation that occurred from the parent graph $y = 2^x$.



- A sequence is a list of elements of the form $a_1, a_2, a_3, \ldots$ where the _____consists of natural numbers $\{1, 2, 3, 4, \ldots\}$.
- Sequences can be defined explicitly or recursively.

Explicit	Recursive
Gives the value of a specific term based on position, n.	Gives the value of a specific term based on the previous term, a_{n-1}.

Skill: Recursive Definition

Given the recursive formula:

$$a_1 = 4$$
$$a_n = 3(a_{n-1} + 2)$$

State the values of a_2, a_3, and a_4.

Regents Practice Questions

Multiple Choice (2pts)

If $a_1 = 2$, and $a_n = n(a_{n-1}) - 1$, what is the value of a_4?

(1) 31

(2) 154

(3) 15

(4) 74

Constructed Response (2pts)

Write the first four terms of the recursive sequence defined below.

$$a_1 = 1$$
$$a_n = 3(a_{n-1})^2 - 1, \text{ for } n > 1$$

- An **arithmetic sequence** is a list of numbers that change by a constant rate from one term to the next resulting in a common _____, d.
- Terms in an arithmetic sequence can be generated using an explicit formula or recursive formula:

Explicit Formula	Recursive Formula
$a_n = a_1 + d(n-1)$	a_1 $a_n = a_{n-1} + d$

Skill: Explicit & Recursive Formulas

Consider the sequence recursively defined by the formula:

$$a_1 = \frac{1}{2}$$
$$a_n = a_{n-1} + 2$$

a. Find the first four terms of this sequence.

b. What is the common difference?

c. Write an explicit formula for a_n.

d. Find the value of the 12^{th} term.

e. Which term has a value of $\frac{33}{2}$?

Regents Practice Questions

Multiple Choice (2pts)

1. Given the following three sequences:

   I. $3, 6, 9, 12, 15, \ldots$
   II. $3, 9, 27, 71{,}213 \ \ldots$
   III. $x, x+1, x+2, x+3, x+4, \ldots$

   Which ones are arithmetic sequences?

   (1) I and III, only
   (2) II and III, only
   (3) I, II, and III
   (4) I and II, only

2. For the sequence $-19, -8, 3, 14, \ldots$, the expression that defines the nth term where $a_1 = -19$ is

   (1) $11 - 19n$
   (2) $11 - 19(n-1)$
   (3) $-19 + 11n$
   (4) $-19 + 11(n-1)$

- A **geometric sequence** is a list of numbers that change by a common _____ , r, from one term to the next.
- Terms in a geometric sequence can be generated using an explicit formula or recursive formula:

Explicit Formula	Recursive Formula
$a_n = a_1(r)^{n-1}$	a_1 $a_n = a_{n-1} \cdot r$

Skill: Recursive Definition

Consider the sequence recursively defined by the formula:

$$a_1 = -2$$
$$a_n = a_{n-1} \cdot 3$$

a. Find the first four terms of this sequence.

b. What is the common ratio?

c. Write an explicit formula for a_n.

d. Find the value of the 8^{th} term.

Regents Practice Questions

Multiple Choice (2pts)

1. What is the common ratio of the geometric sequence whose first term is 4 and third term is 144?

(1) 6
(2) -6
(3) 24
(4) -24

2. If the pattern continues below, how many squares will be in Figure 4?

Figure 1 Figure 2 Figure 3

(1) 10
(2) 8
(3) 32
(4) 16

Operations with Polynomials

Algebra: $50 - 56\%$

Skill: Adding Polynomials

Determine the **sum:**

$(3x^2 - 4 + x) + (10 - x^2 + 6x)$

Skill: Subtracting Polynomials

Determine the **difference:**

$(-2 + x^3 - 5x) - (1 + x^2 + 6x^3)$

Skill: Multiplying Polynomials

Determine the following **products:**

a. $(2x + 3)(x - 4)$

b. $(x + 5)^2$

Regents Practice Questions

Multiple Choice (2pts)

1. When $2k^2 + 5k^4$ is subtracted from $8k^4 + 7k + 4k^2$, the result is:

   (1) $3k^4 + 2k^2 + 3k$

   (2) $3k^4 + 2k^2 + 7k$

   (3) $3k^4 + k^2 + 6k$

   (4) $3k^4 + 2k^2 + 6k$

2. Which polynomial is twice the sum of $3x^2 - x + 1$ and $2x^2 + 5x - 1$?

   (1) $10x^2 + 8x$

   (2) $x^2 - 4x + 2$

   (3) $5x^2 + 4x$

   (4) $2x^2 - 8x + 4$

3. If the length of a piece of paper is represented by $x + 5$ and the width is represented by $4x + 3$, then the paper has a total area represented by:

   (1) $4x^2 + 15$

   (2) $4x^2 - 17x - 15$

   (3) $4x^2 + 23x + 15$

   (4) $4x^2 + 17x - 15$

Constructed Response (2pts)

1. If $A = 2x^2 - 3x$ and $B = 3x^2 + x$ determine $3B - A$:

2. Express $(2x + 1)(x + 3) + \frac{1}{2}x^2$ as a trinomial in standard form.

Skill: GCF

Factor the expressions below using the greatest common factor:

a. $4m^3 - 32m$

b. $63x^{12} - 35x^6$

c. $-28v^2 - 8v - 36$

Skill: DOTS

Factor the expressions below using the difference of two squares:

a. $9a^2 - 1$

b. $121x^2 - 81y^4$

Regents Practice Questions

Multiple Choice (2pts)

1. If $2x$ is one factor of $2x^2 - 10x$, what is the other factor?

(1) $x + 5$ (3) $2x$

(2) $x^2 - 5x$ (4) $x - 5$

2. Which expression is equivalent to $16 - 36x^2$?

(1) $(4 - 6x)(4 + 6x)$ (3) $(8 - 6x)(8 + 6x)$

(2) $(4 - 6x)(4 - 6x)$ (4) $(8 - 18x)(8 + 18x)$

3. When $64x^2 - 121$ is factored, it is equivalent to $(8x + b)(8x - b)$. What is the value of b?

(1) 121 (3) 11

(2) 8 (4) 60.5

4. If $3m^2 + 1$ is one factor of $16m^3 + 48m^5$, what is the other factor?

(1) $16m^2$ (3) $16m^3$

(2) $m + m^2$ (4) $48m^5$

Constructed Response (2pts)

Express $64x^2 - \frac{100}{49}$ in factored form.

Skill: Factoring $a = 1$

Factor the trinomials below:

a. $x^2 + 12x + 20$

b. $x^2 - 10x - 24$

c. $n^2 + 3n - 54$

Skill: Factoring $a > 1$

Factor the trinomials below:

a. $2x^2 + 11x + 5$

b. $3x^2 - 2x - 1$

Regents Practice Questions

Multiple Choice (2pts)

1. The trinomial $x^2 - 10x + 25$ can be expressed as:

(1) $(x - 5)^2$ (3) $(x - 5)(x + 5)$

(2) $(x + 5)^2$ (4) $(x - 5)(x + 2)$

2. Which product is equivalent to $4x^2 + 22x - 12$?

(1) $(5x - 2)(x - 6)$ (3) $2(x - 1)(x + 3)$

(2) $2(2x - 1)(x + 6)$ (4) $2(2x + 1)(x - 6)$

3. Which expression is a factor of $3m^2 + 10m + 7$?

(1) $(3m - 7)$ (3) $(m - 1)$

(2) $(7m + 5)$ (4) $(3m + 7)$

4. Which expression can be used to represent the area of the rectangle represented by $3x^2 - 22x + 35$?

(1) $(x - 7)(3x - 5)$ (3) $(x - 7)(3x + 5)$

(2) $(3x - 7)(x - 5)$ (4) $3(x - 7)(x + 5)$

Skill: Factor Completely

Factor each expression completely using multiple methods.

a. $3x^2 - 18x + 24$

b. $5x^2 - 45$

c. $5x^3 - 20x^2 - 60x$

Regents Practice Questions

Multiple Choice (2pts)

1. Factored completely, the expression $4r^2 - 16r - 20$ is equivalent to

(1) $4(r + 1)(r + 5)$ (3) $(4r + 1)(r + 5)$

(2) $4(r + 1)(r - 5)$ (4) $(r + 1)(r + 5)$

2. Which expression is $64x^2 - 100$ factored completely?

(1) $4(16x^2 - 25)$ (3) $(8x + 10)(8x - 10)$

(2) $4(4x + 5)(4x - 5)$ (4) $-4(16x^2 - 25)$

3. When factored completely, $2m^3 + 8m^2 - 120m$ is equivalent to

(1) $2m(m + 10)(m - 6)$ (3) $2(m + 10)(m - 6)$

(2) $2m^2(m - 6)(m + 10)$ (4) $(2m + 10)(m - 6)$

Constructed Response (2pts)

1. Factor $x^4 - 16$ completely.

2. Factor $100x^2 - 36$ completely.

Skill: Rational & Irrational

Perform each operation below and identify whether the result is rational or irrational.

a. $\sqrt{2} \cdot \sqrt{8}$

b. $2\sqrt{5} + \sqrt{5}$

c. $\frac{2}{3} \cdot \sqrt{9}$

Regents Practice Questions

Multiple Choice (2pts)

Which expression results in a rational number?

(1) $\sqrt{121} - \sqrt{21}$

(2) $\sqrt{36} \div \sqrt{49}$

(3) $5\sqrt{8} + 3\sqrt{8}$

(4) $\sqrt{9} \cdot \sqrt{6}$

Constructed Response (2pts)

1. Is the product of $\sqrt{100}$ and $\frac{4}{5}$ rational or irrational? Explain your reasoning.

2. Amy says that the sum of $\sqrt{25}$ and $\sqrt{9}$ is irrational. Is she correct? Explain your reasoning.

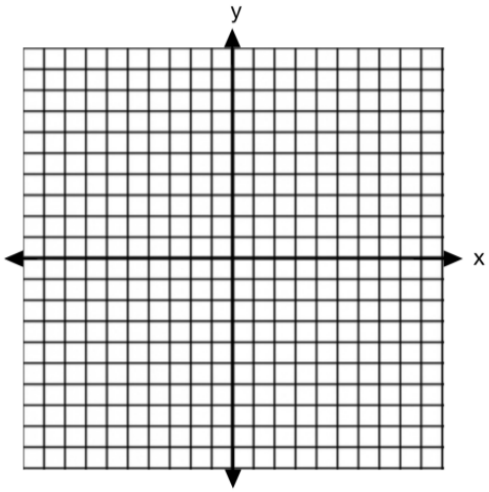
3. Is the product of two rational numbers always rational? Justify your answer.

Skill: Evaluating & Graphing Square Root Functions

Given the function $f(x) = \sqrt{x} - 1$ complete the following.

a. Evaluate $f(256)$.

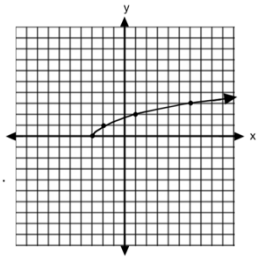
b. Graph $f(x)$ on the set of axes below over the domain $0 \leq x \leq 9$.

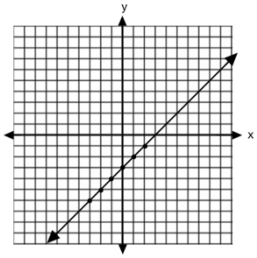


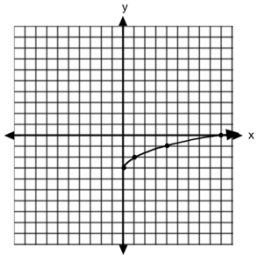
Regents Practice Questions

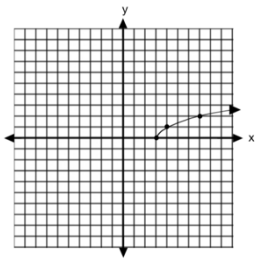
Multiple Choice (2pts)

Which graph represents $h(x) = \sqrt{x-3}$?

(1) 

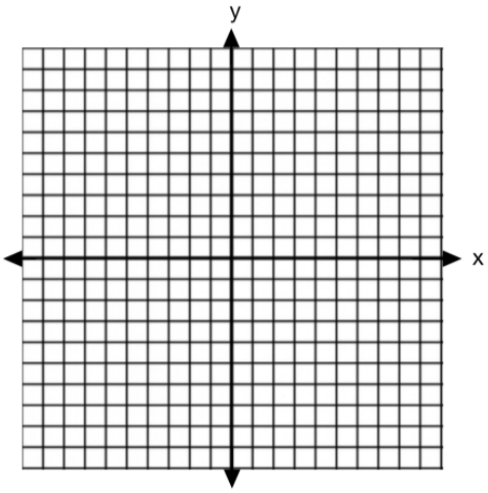
(2) 

(3) 

(4) 

Constructed Response (2pts)

Graph the function $y = -\sqrt{x-2}$ on the set of axes below.



Skill: Definitions & Terminology

Fill in the blank.

1. The **graph** of a quadratic function is known as a _____.
2. The _____ of a quadratic are the values where $y = 0$. Also known as **zeros** or **solutions.**
3. The **turning point** or the _____of a quadratic function is the coordinate that lies at either the _____ or _____ value.
4. The _____ is the **vertical line** that passes through the vertex of a parabola. It is always written as an ____= equation.

Regents Practice Questions

Multiple Choice (2pts)

1. The axis of symmetry and the vertex of $y = x^2 - 8x + 12$ are

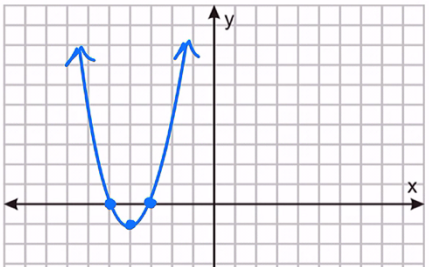
   (1) $x = 4$ and $(4, -4)$

   (2) $y = 4$ and $(4, -4)$

   (3) $x = -4$ and $(-4,4)$

   (4) $y = -4$ and $(-4,4)$

2. What are the vertex and the axis of symmetry of the parabola shown in the diagram below?



   (1) vertex: $(-4, -1)$; axis of symmetry: $x = -1$

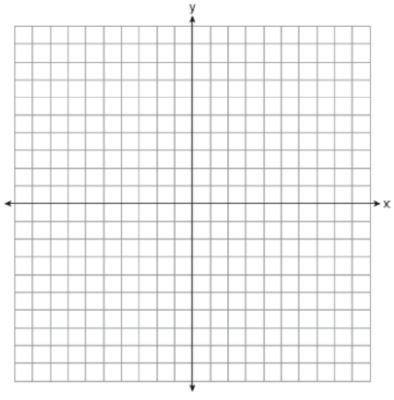
   (2) vertex: $(-1, -4)$; axis of symmetry: $x = -1$

   (3) vertex: $(-1, -4)$; axis of symmetry: $x = -4$

   (4) vertex: $(-4, -1)$; axis of symmetry: $x = -4$

Constructed Response (2pts)

1. Graph the function $f(x) = -x^2 + 4x$ and state the axis of symmetry.



2. Find algebraically the equation of the axis of symmetry and the vertex of the parabola represented by the equation $y = -x^2 - 2x + 1$.

Skill: Solve by Factoring

1. Determine the solution set for the following equations:

   a. $(x-3)(x+4)=0$

   b. $x^2=36$

   c. $x^2-5x=0$

2. Determine the solution set for the following equations:

   a. $x^2-2x-15=0$

   b. $p^2-2p=8$

Regents Practice Questions

Multiple Choice (2pts)

1. If $9x^2-49=0$, the roots of the equation are:

   (1) $\frac{7}{3}$, only
   (2) $-\frac{7}{3}$, only
   (3) $-\frac{7}{3}$ and $\frac{7}{3}$
   (4) $-\frac{3}{7}$ and $\frac{3}{7}$

2. What is the solution set of the equation $y=x^2+19x+48$?

   (1) $\{16,3\}$
   (2) $\{24,2\}$
   (3) $\{-16,-3\}$
   (4) $\{-24,-2\}$

3. Which equation has the solution set $\{-4,6\}$?

   (1) $x^2+2x-24=0$
   (2) $x^2+2x+24=0$
   (3) $x^2-2x-24=0$
   (4) $x^2-2x+24=0$

Constructed Response (2pts)

1. Solve $x^2+3x-28=0$ algebraically.

2. Solve the equation $(x-2)^2=3x-6$. Only an algebraic response will be accepted.

Skill: Vertex Form

Write the quadratic equation below in vertex form by completing the square, then identify the vertex.

$$x^2 + 4x - 100 = -4$$

Skill: Complete the Square

Solve the equation $x^2 - 8x = 10$ by completing the square. Express your answer in simplest radical form.

Regents Practice Questions

Multiple Choice (2pts)

1. When solving the equation $x^2 - 6x - 12 = 0$ by completing the square, which equation is a step in the process?

(1) $(x-3)^2 = 21$ (3) $(x-6)^2 = 21$

(2) $(x-3)^2 = 15$ (4) $(x-6)^2 = 15$

2. Sean correctly used the method of completing the square to solve the equation $x^2 - 8x - 24 = 0$. Sean's first step was to rewrite the equation as $x^2 - 8x = 24$. He then added a number to both sides of the equation. Which number did he add?

(1) 8 (3) 16

(2) 4 (4) 2

Constructed Response (4pts)

1. Use the method of completing the square to determine the exact values of x that solve the equation.

$$x^2 + 4x = 2$$

2. A student was asked to solve the equation $x^2 - 6x - 12 = 0$ by completing the square. Their first step is shown below:

$$x^2 - 6x = 12$$

The next step in the student's process was:

$$x^2 - 6x + c = 12 + c$$

State the value of c that creates a perfect square trinomial. Explain how the value of c is determined.

Skill: Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Determine the roots of the equations below using the quadratic formula. Round to the nearest tenth if necessary.

a. $x^2 - 8x = 105$

b. $2x^2 + 7x - 3 = 0$

Regents Practice Questions

Multiple Choice (2pts)

1. The roots of the equation $2n^2 - 12n = 10$ are

(1) No solution
(3) $\{1.841, -0.698\}$
(2) $\{6.742, -0.742\}\}$
(4) $\{0.354, -0.354\}\}$

2. If the quadratic formula is used to find the roots of the equation, $5a^2 = 11$, the correct roots are

(1) $\left\{\frac{\sqrt{11}}{5}, \frac{-\sqrt{11}}{5}\right\}$
(3) $\{\sqrt{11}, -\sqrt{11}\}$
(2) No solution
(4) $\left\{\sqrt{\frac{11}{5}}, -\sqrt{\frac{11}{5}}\right\}$

Constructed Response (2pts)

1. Solve the equation $6x^2 - 2x - 5 = 0$ and express the answer in simplest radical form.

2. Solve $4x^2 - 7 = 7x$ algebraically for x, to the nearest tenth.

Skill: Projectile Motion

A baseball is hit into the air with an initial upward velocity of 64 ft./s. It's height in feet after t seconds can be modeled by the function $h(t) = -16(t)^2 + 64t + 6$.

a. What is the **initial height** of the ball before it is hit? (y-intercept)

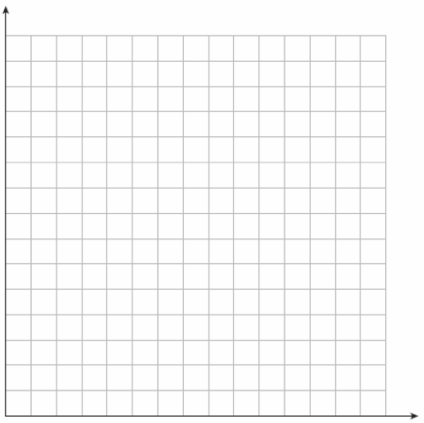
b. Determine the axis of symmetry.

c. What is the maximum height that the baseball reaches? (Hint: use your answer to part b.)

d. What feature of the graph represents when the ball hits the ground?

e. How many seconds does it take for the ball to reach the ground? Round your answer to the nearest tenth.

f. Create a rough sketch of $h(t)$ on the axes below.



Regents Practice Questions

Multiple Choice (2pts)

1. Rachel went cliff jumping and jumped off the cliff into the water. Her height as a function of time could be modeled by the function $h(t) = -16t^2 + 16t + 480$, where t is the time in seconds and h is the height in feet. After how many seconds did Rachel hit the water?

   (1) 16 seconds (3) 2 seconds

   (2) 6 seconds (4) 480 seconds

2. If a toy rocket is launched vertically upward from ground level with an initial velocity of 128 feet per second, then its height h after t seconds is given by the equation $h(t) = -16t^2 + 128t$. After how many seconds will the rocket be 112 feet above the ground?

   (1) 1 second (3) 3 seconds

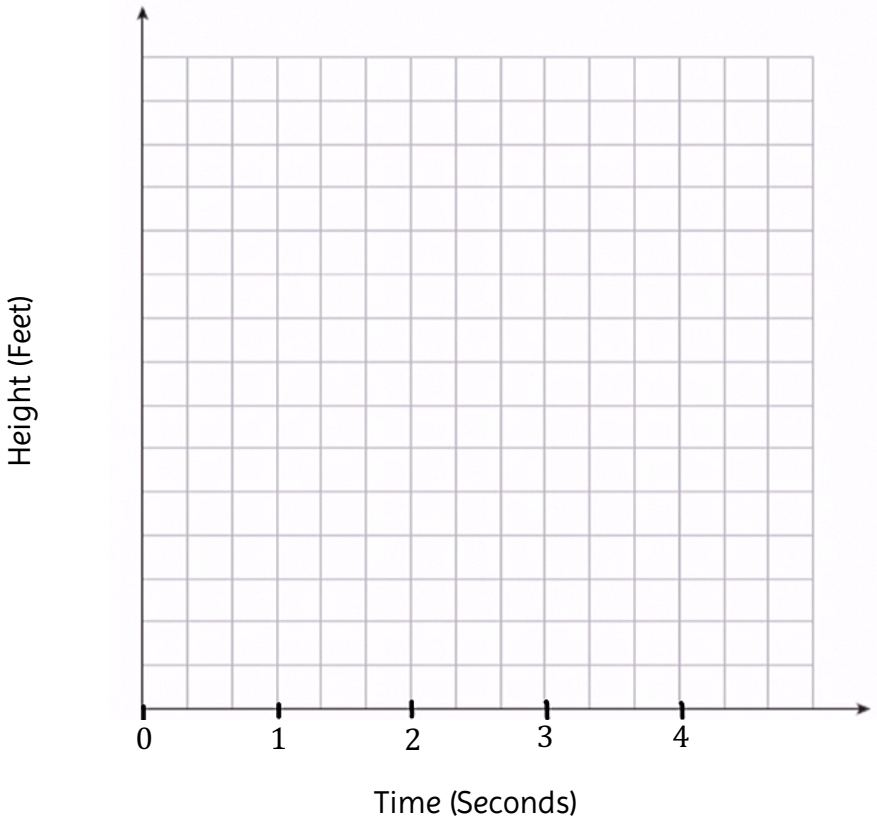
   (2) 2 seconds (4) 4 seconds

Constructed Response (4 pts)

A ride at an amusement park takes riders to the top of a tower and drops them back down to the starting point. A function that approximates this ride is $h(t) = -16t^2 + 64t + 60$, where $h(t)$ is the height in feet after t seconds.

a. Algebraically determine how many seconds it takes for riders to reach a height of 124 feet?

b. Graph this function on the axes provided over the domain $0 \leq t \leq 4$ and be sure to use an appropriate scale for $h(t)$.



Skill: Linear Regression

Natalia recorded her heart rate, in beats per minute (bpm), after doing different sets of bench press. Her results are shown in the table below.

Number of bench press x	Heart Rate (bpm) y
0	65
5	71
15	96
20	112
22	121

a. State the linear regression equation that can be used to estimate Natalia's heart rate based on the number of bench press reps she completes. Round all coefficients to the nearest hundredth.

b. State the correlation coefficient of the linear regression equation. Round to the nearest hundredth.

c. Explain what the correlation coefficient suggests in terms of the context of the problem.

Regents Practice Questions

Constructed Response (4pts)

During a recent school year, statistics were collected on the percentage of students scoring an 80 or better on a physics final exam and organic chemistry final exam for 8 colleges.

Percentage of Students Scoring an 80 or better	
Physics x	Organic Chemistry y
28	27
53	14
35	18
54	20
44	25
62	30
36	42
14	11

a. Write a linear regression equation that models the data, round all coefficients to the nearest hundredth.

b. State the correlation coefficient, round to the nearest hundredth. Explain what this tells us about the data.

Skill: Box Plot

Draw a box plot for the data set below. Then identify the 5-number summary and range.

$$56, 32, 34, 38, 33, 41, 12, 88$$

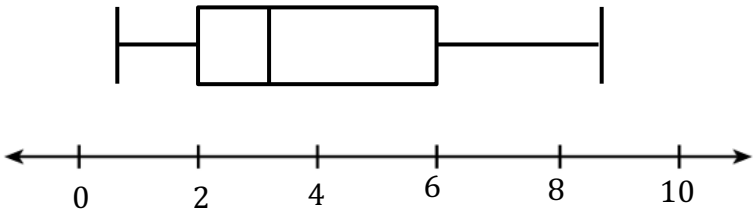
Min: _____ Q_1: _____ Med: _____ Q_3: _____ Max: _____

Range: _____

Regents Practice Questions

Multiple Choice (2pts)

The box plot below summarizes data that measured the average time, in hours, students in Mrs. Gonzales's class studied for their math test on Thursday.



Which of the following represents the third quartile?

(1) 2 hours

(2) 3.25 hours

(3) 6 hours

(4) 9 hours

Skill: Percentages

Students from class A and class B were asked to name their favorite subject from a list of math, science, and art. The results are shown in the table below.

	Math	Science	Art
Class A	12	8	10
Class B	5	16	6

What percentage of the students chose Art as their favorite subject?

Regents Practice Questions

Multiple Choice (2pts)

ITC college conducted a survey of freshman and sophomore students to determine whether they are traveling home for break or staying on campus. The results are shown in the table below.

	Going Home	Staying on Campus	Total
Freshman	234	46	280
Sophomore	336	143	479
Total	570	189	759

Of the students who are staying on campus, approximately what percent were Sophomores?

(1) 75.7%

(2) 24.9%

(3) 24.3%

(4) 63.1%

Constructed Response (2pts)

A survey of 82 people was taken. It found that 62 people worked in finance, and 18 of these people did not like their job. The survey also found that 20 people worked in education and of the people who worked in education, 75% liked their job. Complete the two-way frequency table.

	Finance	Education	Total
Like Job			
Don't Like Job			
Total			

Skill: Standard Deviation

Find the standard deviation for each of the data sets shown below rounded to the nearest hundredth. Then identify which of the data sets has the least variability. Explain how you arrived at your answer.

Data Set #1	Data Set #2
14	12
1	22
8	28
11	24
4	23
18	25

Regents Practice Questions

Constructed Response (2 pts)

Julio is planning a vacation and can't decide between Scottsdale and Manhattan Beach. He obtained the high temperature data from the last week for both states to help guide his decision.

Scottsdale	86	87	84	83	85	88	89

Manhattan Beach	78	83	90	87	85	76	72

Julio wants to pick the destination with the least variability in temperature. Which spot should he choose? Explain how you arrived at your answer.

Constructed Response (2 pts)

Mrs. Robin gave her 7th and 8th period chemistry classes the same exam. The results of the scores are shown in the table below.

	$\bar{x}$	σ_x	n	Min	Q_1	Med	Q_3	Max
7th Period	74.34	8.61	26	52	68	72.5	88.5	98
8th Period	76.4	10.68	26	60	72.5	78	89	95

Based on these data, which class had the least spread in test scores? Explain how you arrived at your answer.