Math 113 Name:_____

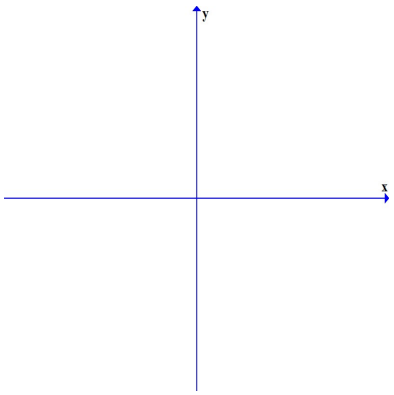
FINAL EXAM REVIEW & KEY

Final Exam Study Suggestions
The 50 question, multiple-choice final exam consists of two parts: no calculator and calculator. To help you thoroughly study for the final exam, the mathematics department has prepared this review packet. The review contains 50 open-response questions (A) and 50 multiple-choice questions (B). After working all the open-response questions, use the multiple-choice questions as a practice test. Set aside a one hour and 50 minute block of time and complete the multiple-choice questions without using your notes, text, or a tutor. Use the answer key to check your work and pay close attention to the questions you get wrong. Additional practice on the concepts giving you difficulty is suggested. Refer to your notes or text for additional practice problems. Seek help from your instructor or a tutor.

Additional study tips are:

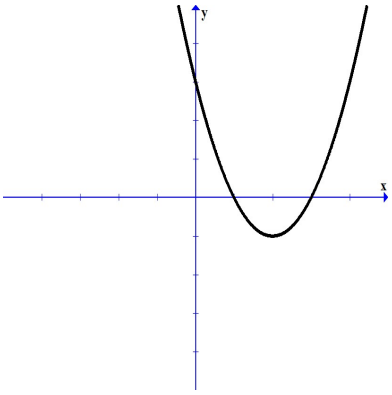
- Watch for sign errors!
- Check your answer in the problem.
- Final Exam problems combine ideas - think through the steps necessary to get the correct answer.
- Be sure to study ideas that look similar but are very different.
- Use the distinguishing characteristics of equations to guide you in selecting an appropriate method for solving.
- Complete the Math 113 Review in time to get help from the LAC and/or your instructor. Do not wait until the day before the Final Exam.
- Know when your final is scheduled:
  - Day and Date _____
  - Time _____
  - Room _____
- Bring sharpened #2 pencils with erasers, a Scantron F-1712-PAR-L, a calculator, and your Schoolcraft ID number.
- Review questions 1-25 reflect the type of skills tested on the **No Calculator** part of the test.

1A. Sketch the graph of $f(x) = -(x-2)^2 + 1$. Label and identify the vertex.

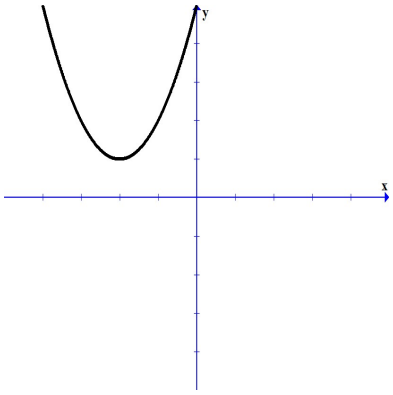


1B. Identify the graph of $f(x) = (x+2)^2 - 1$.

A)



C)



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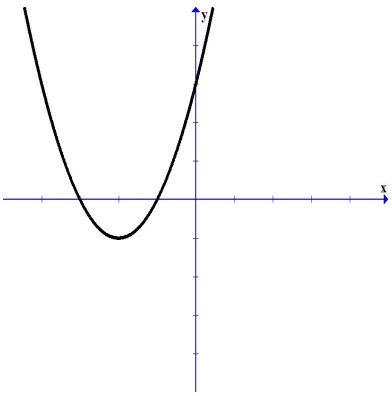

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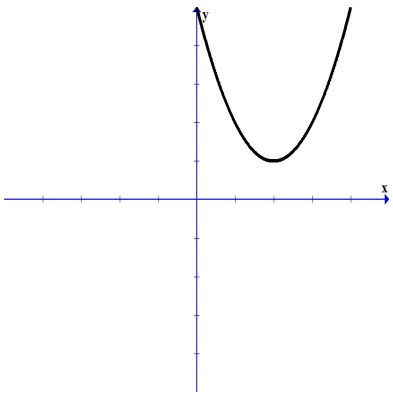
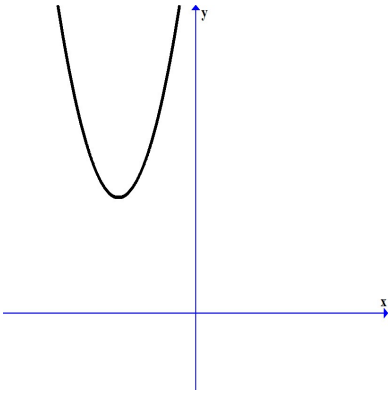


2A. Find the vertex of $f(x) = -x^2 - 2x + 3$ and determine whether the parabola opens up or down.

2B. Use the vertex to determine which of the following is the graph of $f(x) = 2x^2 + 8x + 11$.

A)



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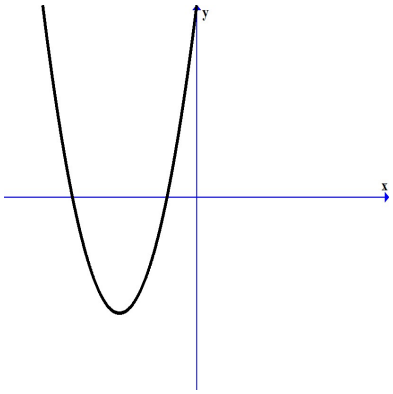
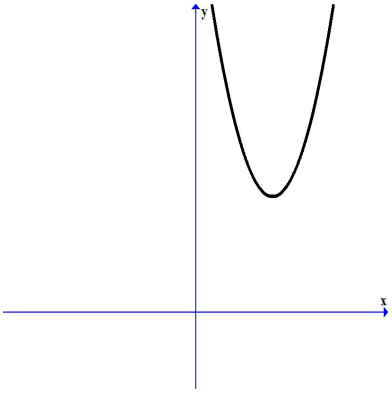


B)



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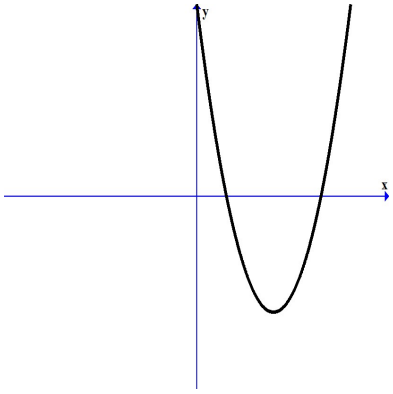
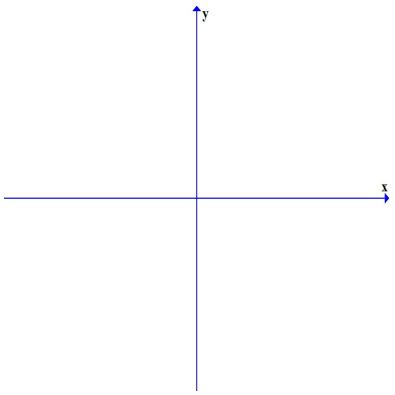
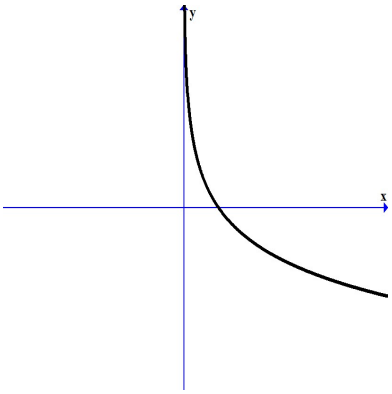


3A. Sketch the graph of $f(x) = \log_{10} x$.

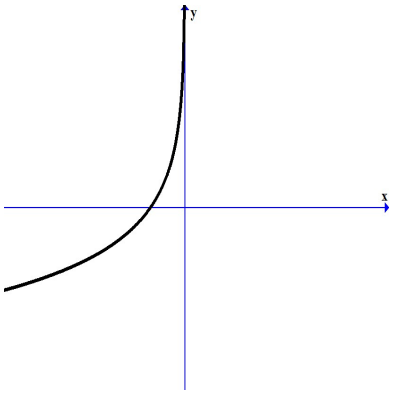


3B. Identify the graph of $f(x) = \log_{1/2} x$.

A)



C)



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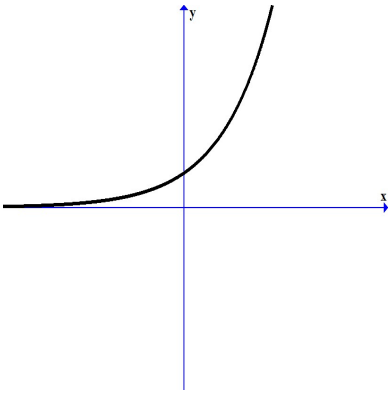

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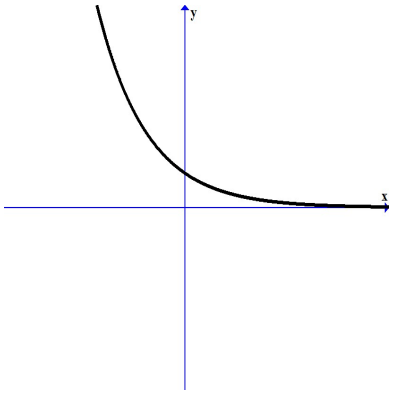
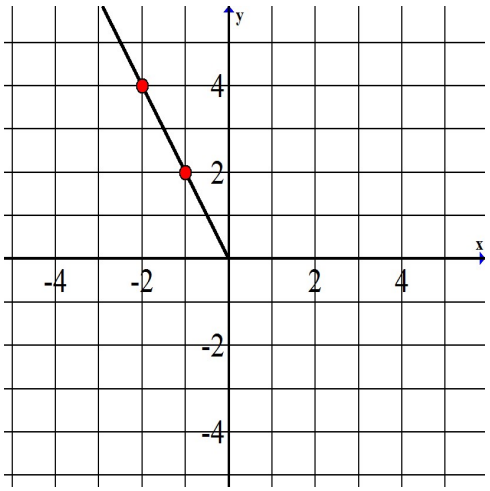
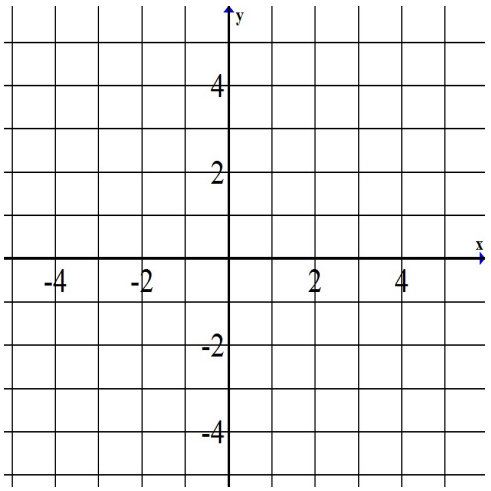
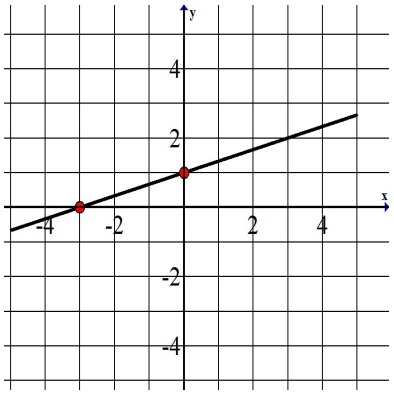


4A. Graph the inverse function.

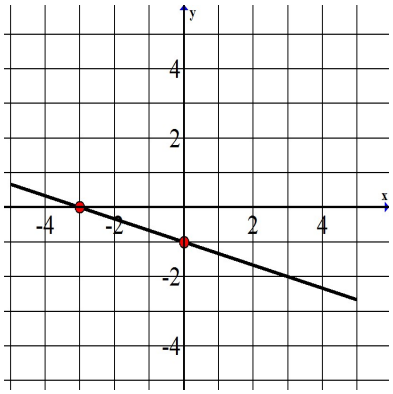




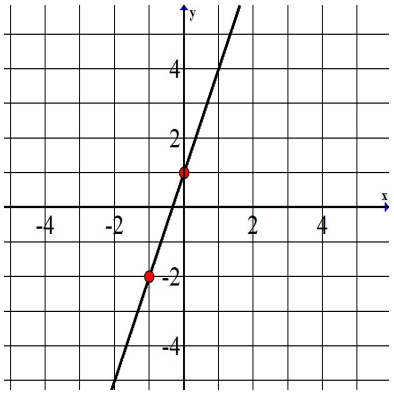
4B. Which of the following graphs represents the inverse of the graph given below?



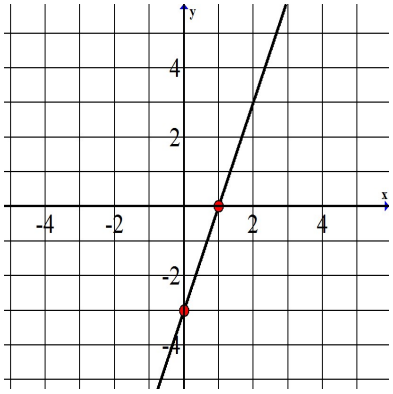
A)



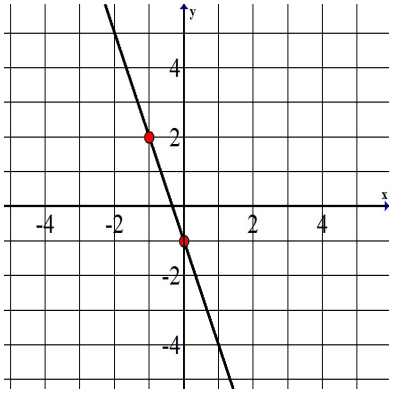
C)



B)



D)



5A. Solve.

$\sqrt{8x-7}-1=6$

5B. Solve.

$\sqrt{22y+86}=y+9$

A) $y=5,\ y=-1$

B) $y=11\pm 3\sqrt{14}$

C) $y=-\frac{83}{21}$

D) $y=5$

6A. Solve for x.

$3^{3x} = 81$

6B. Solve for x.

$4^x = 64^{x-1}$

A) $x = 0$

B) $x = \frac{4}{3}$

C) no solution

D) $x = \frac{3}{2}$

7A. Solve for x.

$\log_6(x^2 - x) = 1$

7B. Solve for x.

$\log_7(x + 6) = 0$

A) $x = -5$

B) $x = -6$

C) $x = 0$

D) $x = 1$

8A. Solve $\ln(3x - 5) = 2$. Write your answer as an exact value.

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8B. Which of the following has the same solution as $\log(x - 3) = 7$?

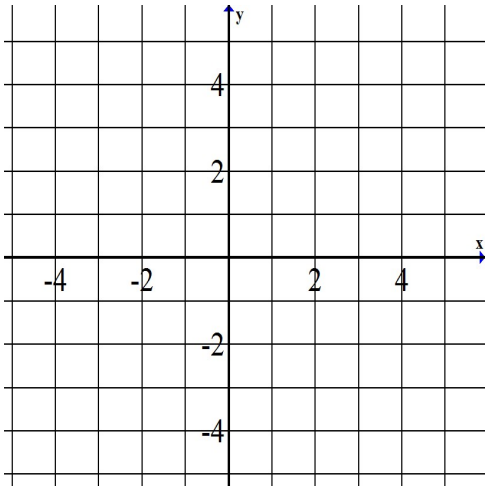
A) $10^7 = x - 3$

B) $10^7 = x + 3$

C) $(x - 3)^7 = 10$

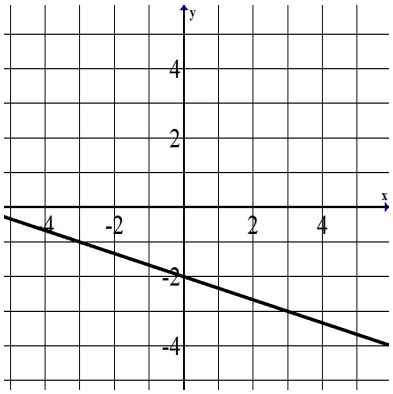
D) $7^{10} = x - 3$

9A. Graph $y = -3x + 1$.

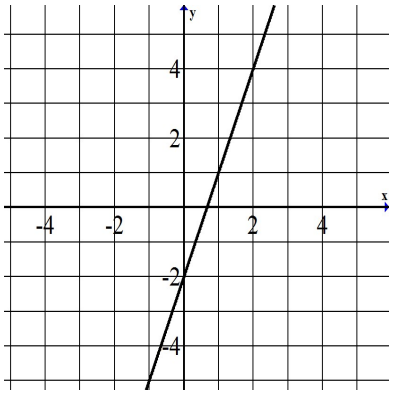


9B. Identify the graph of $y = \frac{1}{3}x - 2$.

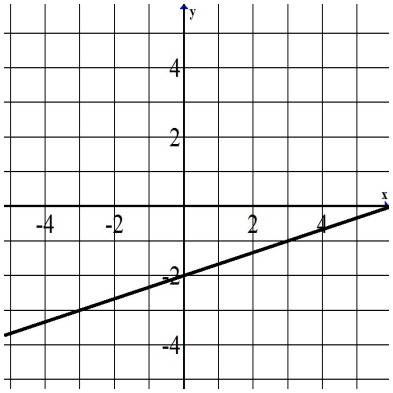
A)



C)



B)



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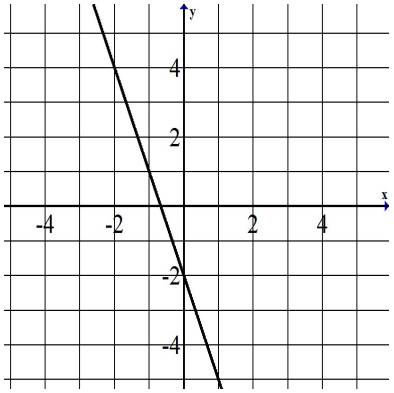
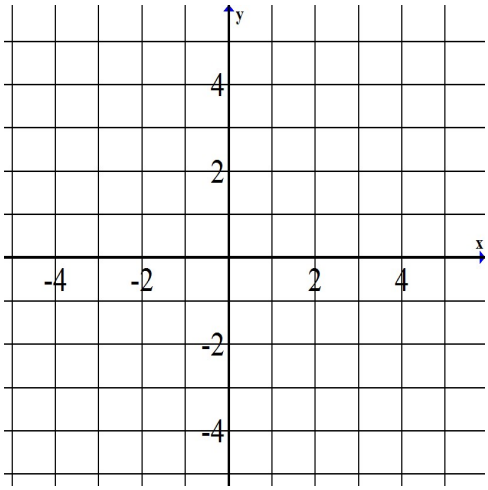
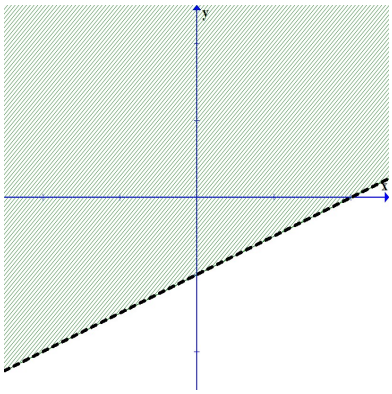


10A. Graph the solution set for $x + y > 2$.

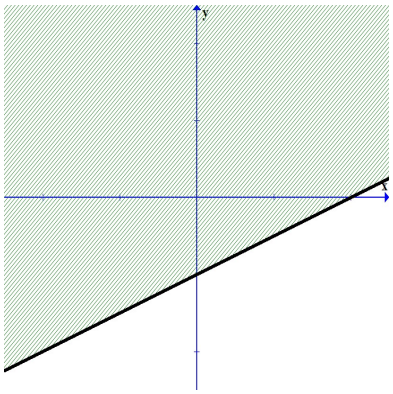


10B. Identify the graph of the solution set for $x - 2y \leq 4$.

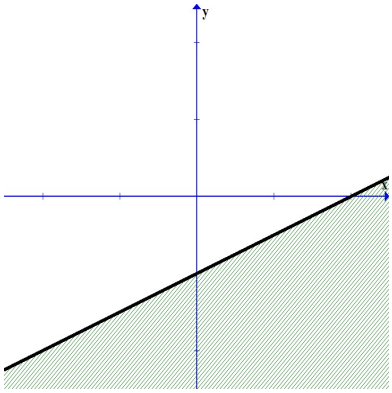
A)



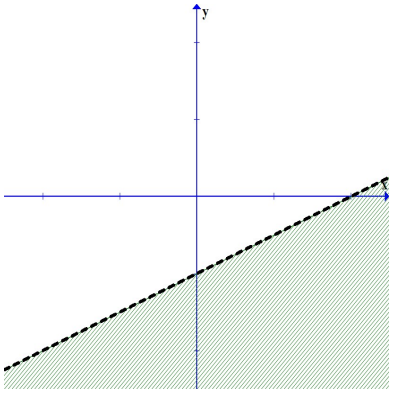
C)



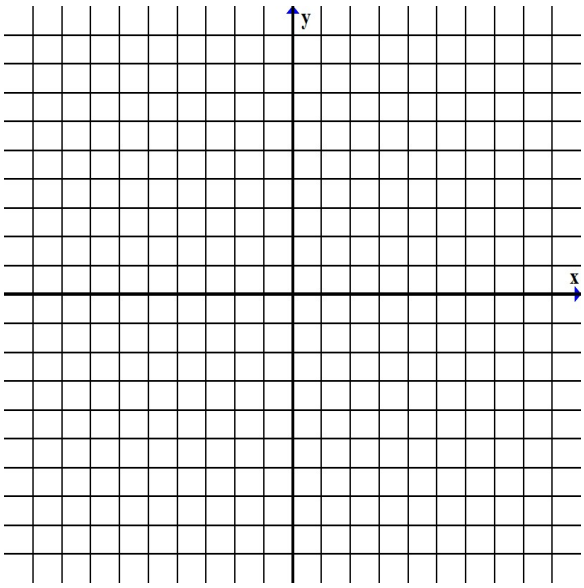
B)



D)



11A. Graph the circle $x^2 + (y-4)^2 = 16$ on the axes below. State the center and radius.



Center = _____

Radius = _____

11B. Find the center and radius of the circle $(x+4)^2 + (y-7)^2 = 9$.

A) Center = (4,-7), Radius = 3

B) Center = (-4,7), Radius = 3

C) Center = (4,-7), Radius = 9

D) Center = (-4,7), Radius = 9

12A. Suppose $g(x) = |x + 2| - 3$. In which direction(s), and by how many units, would we shift the graph of $f(x) = |x|$ in order to obtain the graph of $g(x)$?.

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12B. If we started with the graph of $f(x) = \sqrt{x}$, in which direction would we shift to graph $g(x) = \sqrt{x - 3}$?

A) Up

B) Down

C) Left

D) Right

13A. Find the equation of a line passing through $(8, -3)$, parallel to $y = -\frac{3}{4}x + \frac{7}{4}$. Write your answer in function notation.

13B. Find the equation of a line passing through $(6, -2)$, perpendicular to $y = \frac{3}{5}x - \frac{1}{5}$.

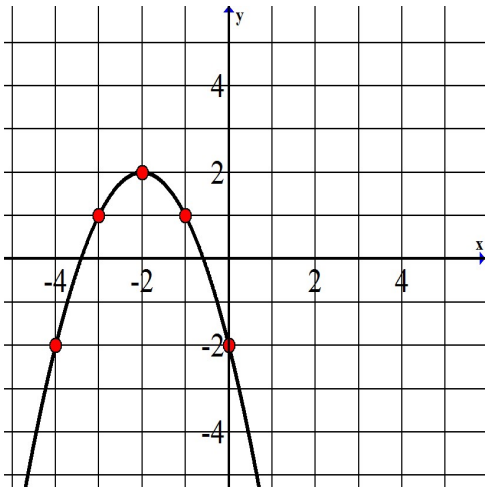
A) $f(x) = -\frac{5}{3}x - \frac{1}{5}$

B) $f(x) = -\frac{3}{5}x - \frac{1}{5}$

C) $f(x) = -\frac{3}{5}x + 8$

D) $f(x) = -\frac{5}{3}x + 8$

14A. Use the graph below to find all values of x such that $f(x) = -2$.



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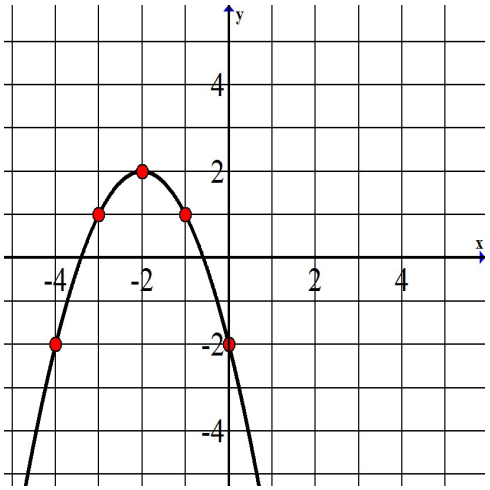
14B. Use the graph below to find $f(-2)$.



A) 0

B) -2

C) 1

D) 2

15A. If $f(x) = x + 1$ and $g(x) = x^2 - 1$, find $(f \circ g)(x)$ and $(g \circ f)(x)$.

15B. If $f(x) = 7 - 6x$ and $g(x) = 2x^2 - 3x + 1$, find $(g \circ f)(0)$.

A) 1

B) 7

C) 0

D) 78

16A. If $f(x) = 4x^2 - 9$ and $g(x) = 2x - 3$, find the following:

I. $(f+g)(x) =$ _____

II. $(f-g)(x) =$ _____

III. $(f \cdot g)(x) =$ _____

IV. $\left(\frac{f}{g}\right)(x) =$ _____

16B. If $f(x) = 2x^2 + 5$ and $g(x) = 3x^2 - 4$, find $(f - g)(x)$.

A) $x^2 - 9$

B) $-x^2 - 9$

C) $-x^2 + 9$

D) $-x^2 + 1$

17A. Solve the compound inequality and graph the solution set.

$x > 1$ and $2x - 7 < x + 9$

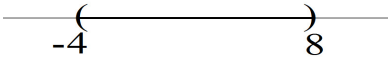
_____

17B. Solve the compound inequality and select the graph which describes the solution set.

$2x - 3 > x + 5$ or $x - 4 < 2x$

A)

B)



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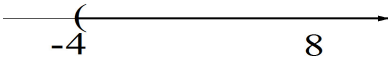


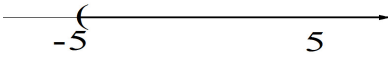
D)

18A. Graph the solution set.

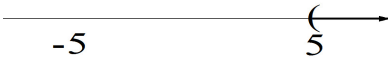
$|x| \leq 3$

18B. Which of the following is the solution set for $|x| > 5$?

A)

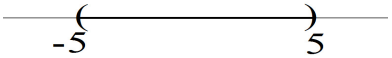


B)



C)

D)



19A. Solve.

$$\left|\frac{t}{3}+1\right| = 7$$

19B. The equation $|2x-5|-20=-10$ can be solved by solving which of the related equation(s)?

A) $2x-5-20=-10$

B) $2x-5=10$ or $2x-5=-10$

C) $2x-5-20=-10$ or $2x-5-20=10$

D) $2x-5=10$ or $2x+5=10$

20A. Solve the inequality and write the solution in interval notation.

$|4x - 5| + 3 \leq 10$

20B. Solve the inequality.

$|2x - 9| > 15$

A) $(12, \infty)$

B) $(-\infty, -12) \cup (3, \infty)$

C) $(-3, 12)$

D) $(-\infty, -3) \cup (12, \infty)$

21A. Solve the equation by completing the square.

$x^2 - 14x = 8$

21B. Fill in the blank. To solve $x^2 + 6x = 8$ by completing the square, add _____ to both sides.

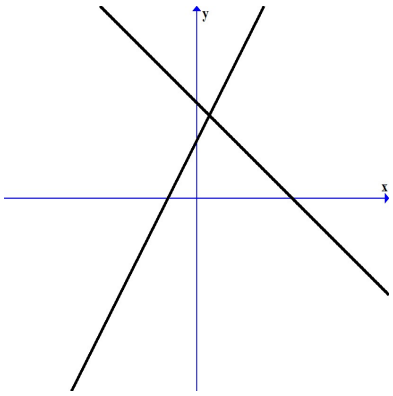
A) 6

B) 3

C) 9

D) 36

22A. Determine the number of solutions to this system.



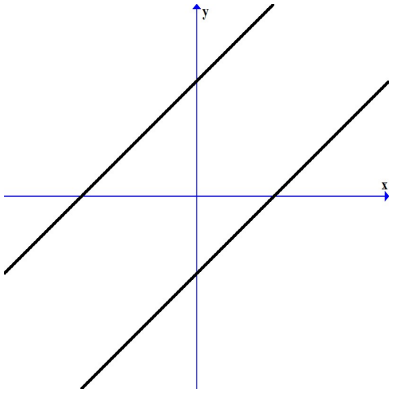
A) 0

B) 1

C) 2

D) infinitely many

22B. Determine the number of solutions to this system.



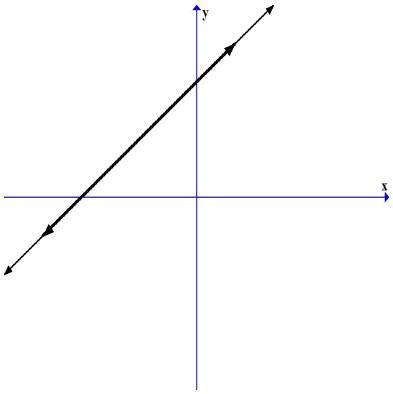
A) 0

B) 1

C) 2

D) infinitely many

22C. Determine the number of solutions to this system.



A) 0

B) 1

C) 2

D) infinitely many

23A. One number is 4 more than twice the second number. Their total is 25. Find the two numbers.

_____

23B. An appliance store is having a sale. One day a salesperson sells 3 televisions and 4 stereos for \$2530. The next day the same employee sells 5 of the same televisions and 3 of the same stereos for \$2860. Select the system which when solved will give the price of one television and one stereo.

A) $\begin{aligned} 3x + 5y &= 8 \\ 4x + 3y &= 7 \end{aligned}$

B) $\begin{aligned} 3x + 4y &= 2530 \\ 5x + 3y &= 2860 \end{aligned}$

C) $\begin{aligned} 4x + 3y &= 2530 \\ 5x + 3y &= 2860 \end{aligned}$

D) $\begin{aligned} 3x + 4y &= 2530 \\ 3x + 5y &= 2860 \end{aligned}$

24A. Consider the set of ordered pairs $f = \{(7,3),(-1,1),(5,0),(4,-2)\}$. Is f a one-to-one function? Why?

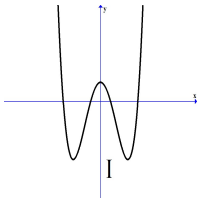
24B. Which of the following are one-to-one functions?

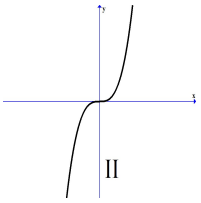
A) only I

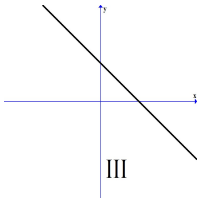
B) I and IV

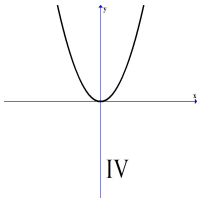
C) II and III

D) only IV









25A. Given $f(x) = \dfrac{x-3}{7}$, find $f^{-1}(x)$.

_____

25B. Find the inverse of the function $f(x) = x^3 - 5$.

A) $f^{-1}(x) = x^3 + 5$

B) $f^{-1}(x) = \sqrt[3]{x+5}$

C) $f^{-1}(x) = \dfrac{1}{x^3 - 5}$

D) $f^{-1}(x) = \dfrac{1}{x^3} - \dfrac{1}{5}$

26A. Find the maximum value of $y = -5x^2 + 4x - 1$.

_____

26B. A trailer company has found that the revenue from sales of heavy duty truck trailers is a function of the price p it charges. If the revenue is given by $R(p) = -\frac{3}{4}p^2 + 2700p$, what is the maximum revenue?

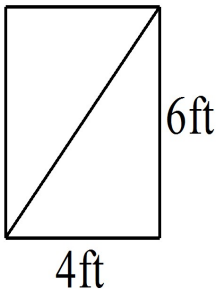
A) \$1800

B) \$2700

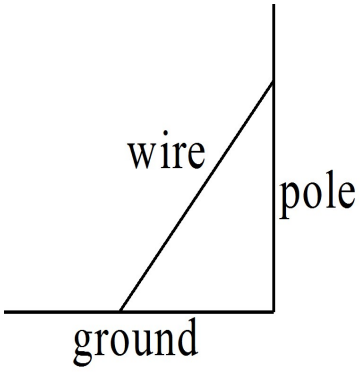
C) \$2,430,000

D) \$2,700,000

27A. Find the length of a diagonal brace on a rectangular gate which is 4 feet wide and 6 feet tall. Round to one decimal place.



27B. A wire is to be attached to support a telephone pole. Because of surrounding buildings, sidewalks, and roadways, the wire must be anchored 27 feet from the base of the pole. A technician uses 50 feet of wire and attaches it to the pole and to the stake on the ground. To the nearest foot, determine how high from the base of the pole the wire can be attached.



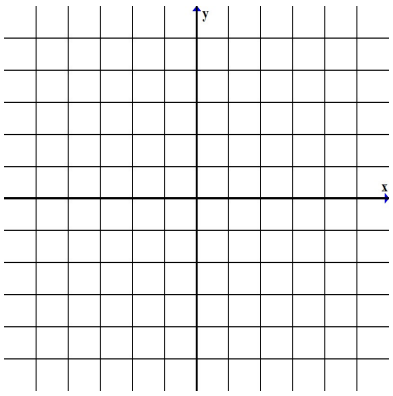
A) 23 feet

B) 42 feet

C) 57 feet

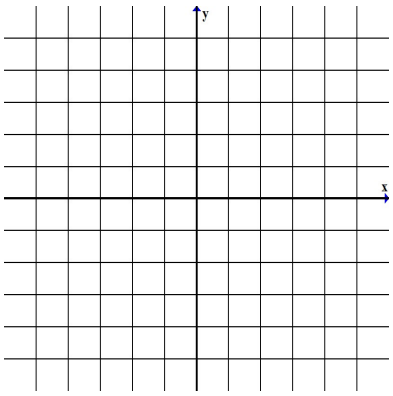
D) 77 feet

28A. Find the distance between the points $(-2, 3)$ and $(1, -2)$. Give an exact answer.



_____

28B. Find the distance between the points $(-3, 1)$ and $(2, -1)$.



A) 1

B) $\sqrt{5}$

C) $\sqrt{7}$

D) $\sqrt{29}$

29A. The enrollment at Livonia Community College is described by the function $f(x) = 250x + 6000$, where x is the number of years since 2010.

I. Find the enrollment in 2016. _____

II. In what year will the enrollment reach 10,000? _____

29B. The per person consumption (in pounds) of chicken in the U.S. is approximated by the function $P(x) = 1.26x + 45.18$, where x is the number of years since 2018. In what year will the per person consumption reach 54 pounds?

A) 2022

B) 2025

C) 2027

D) 2030

30A. The volume V of a gas varies directly as the temperature T, and inversely as the pressure P. If $V = 48$ cm^3 when $T = 320$K and $P = 20$ kPa, find the volume when $T = 280$K and $P = 30$ kPa.

30B. The period of a simple pendulum varies directly as the square root of its length. If a 3 foot long pendulum has a period 2 seconds, find the length of a pendulum with a period 4 seconds.

A) $\frac{2\sqrt{3}}{3}$ feet

B) $\frac{\sqrt{3}}{4}$ feet

C) 12 feet

D) 6 feet

31A. If $f(x) = \sqrt{5x - 2}$, find $f(10.6)$, rounded to two decimal places.

_____

31B. If $g(x) = \sqrt[3]{3x + 1}$, find $g(8)$, rounded to two decimal places.

A) 0.36

B) 2.92

C) 3.88

D) 5.00

32A. Simplify $\sqrt[5]{-1024m^{20}}$

_____

32B. Simplify.

$\sqrt[3]{-216x^{21}}$

A) $-72x^7$

B) $-6x^{18}$

C) not a real number

D) $-6x^7$

33A. Simplify completely. Assume all variables represent positive numbers.

$7\sqrt{75xy^3} - 4y\sqrt{12xy}$

33B. Simplify completely. Assume all variables represent positive numbers.

$9a\sqrt{20a^3b^2} + 7b\sqrt{45a^5}$

A) $39ab\sqrt{5a^3}$

B) $1890a^5b^2$

C) $39a^2b\sqrt{5a}$

D) $9a^3b(4b + 7a)\sqrt{5a}$

34A. Multiply. Assume x represents a positive number.

$\sqrt{7x}(\sqrt{7} - \sqrt{x})$

34B. Multiply. Assume x represents a positive number.

$(\sqrt{5x} - 6)(\sqrt{5x} - 2)$

A) $10x + 4\sqrt{5x} + 12$

B) $5x + 4\sqrt{5x} + 12$

C) $10x - 4\sqrt{5x} + 12$

D) $5x - 8\sqrt{5x} + 12$

35A. Rationalize the denominator and simplify completely.

$$\frac{\sqrt{3}-1}{\sqrt{3}+1}$$

35B. Rationalize the denominator and simplify completely. Assume y represents a positive number.

$$\frac{20xy^2}{\sqrt{5y}}$$

A) $4xy$

B) $4xy\sqrt{5y}$

C) $\frac{4xy\sqrt{5y}}{5}$

D) $4xy\sqrt{5}$

36A. The function $V(r) = \sqrt{2.5r}$ can be used to estimate the maximum safe velocity V, in miles per hour, at which a car can travel if it is driven along a curved road with radius of curvature r, in feet.

I. To the nearest whole number, find the maximum safe speed if a cloverleaf exit on an expressway has a radius of curvature of 390 feet.

_____

II. Find the radius of curvature if the safe velocity is 25 mph.

_____

36B. The period of a pendulum is the time it takes for the pendulum to make one full back-and-forth swing. The formula for period, P, in seconds, is $P = 2\pi\sqrt{\frac{L}{32}}$ where L is the length of the pendulum in feet. Find the period of a pendulum whose length is 23 feet, rounded to two decimal places.

A) 5.33 seconds

B) 2.13 seconds

C) 0.94 seconds

D) 0.38 seconds

37A. Simplify using properties of exponents. Write the answer using positive exponents only.

$(16x^{10}y^{-2}z^4)^{1/2}$

37B. Simplify using properties of exponents.

$\left(\dfrac{16x^4yz^5}{2xy^{10}z^{-1}}\right)^{-1/3}$

A) $\dfrac{y^3}{2xz^2}$

B) $\dfrac{-8xz^2}{3y^3}$

C) $\dfrac{y^3}{3x^3z^6}$

D) $\dfrac{y^3}{2x^3z^{4/3}}$

38A. Multiply. Assume y represents a positive number.

$(y^{1/2}+2)(y^{1/2}-6)$

38B. Multiply. Assume x represents a positive number.

$4x^{1/3}(x^{1/4}+x)$

A) $4x^{1/2}+x^{1/3}$

B) $4x^{2/7}+4x^{1/3}$

C) $4x^{7/12}+4x^{4/3}$

D) $4x^{2/7}+4x^{1/2}$

39A. Use the formula $A = P(1 + r)^t$ to find the rate r at which \$2000 grows to \$2400 in 2 years. Give the rate as a percent rounded to one decimal place.

_____

39B. Use the formula $A = P(1 + r)^t$ to find the rate r at which \$1600 grows to \$1764 in 2 years.

A) 3%

B) 5%

C) 8%

D) 12%

40A. Use the quadratic formula to solve the equation.

$x^2 + x + 2 = 0$

40B. Use the quadratic formula to solve the equation.

$5x^2 - 8x = 3$

A) $x = \dfrac{-4 \pm \sqrt{31}}{5}$

B) $x = \dfrac{4 \pm \sqrt{31}}{5}$

C) $x = \dfrac{-4 \pm 2\sqrt{31}}{5}$

D) $x = \dfrac{4 \pm 2\sqrt{31}}{5}$

41A. Jack's workout consists of jogging for 3 miles, then biking for 5 miles at a speed 4 mph faster than he jogs. If the total workout time is 1 hour, find his biking speed.

_____

41B. Together, Karen and Tom can clean their whole house in 3 hours. Alone, Karen can clean the house in one hour less time than Tom can alone. About how long does it take Karen working alone to clean the house?

A) 4.3 hours

B) 5.5 hours

C) 6.5 hours

D) 7.4 hours

42A. Solve the inequality and write the solution set in interval notation.

$x^2 - x - 2 \geq 0$

42B. Solve the inequality.

$x^2 - 2x - 3 < 0$

A) $(-\infty, -1) \cup (3, \infty)$

B) $(-3, 1)$

C) $(-\infty, -3) \cup (1, \infty)$

D) $(-1, 3)$

43A. Solve the system $\begin{cases} 2x - y = -4 \\ 3x - 5y = 15 \end{cases}$

_____

43B. Solve the system for y only.

$$\begin{cases} 4x + 5y = 3 \\ 2x - 3y = 7 \end{cases}$$

A) $y = 2$

B) $y = 11$

C) $y = 17$

D) $y = -1$

44A. Solve the system $\begin{cases} x + y + 2z = 9 \\ 2x + 4y - 3z = 1 \\ 3x + 6y - 5z = 0 \end{cases}$

44B. Solve the system for x only.

$$\begin{cases} x + 2y + 3z = 5 \\ 2x + 5y + 3z = 3 \\ x + 8z = 17 \end{cases}$$

A) $x = -16$

B) $x = 1$

C) $x = 33$

D) $x = -1$

45A. Write $\log_6\left(\frac{1}{6}\right) = -1$ as an exponential equation.

45B. Convert the equation into logarithmic form.

$5^{x-3} = y$

A) $\log_y(x-3) = 5$

B) $\log_5 y = x - 3$

C) $\log_5(x-3) = y$

D) $\log_y 5 = x - 3$

46A. Express $\log_6 18 + \log_6 2 - \log_6 9$ as a single logarithm.

46B. Rewrite using the properties of logarithms.

$\log_b(\sqrt{7x})$

A) $\sqrt{\log_b 7 + \log_b x}$

B) $\log_b\left(\frac{7}{2}\right) + \log_b\left(\frac{x}{2}\right)$

C) $\frac{1}{2}\log_b 7 + \frac{1}{2}\log_b x$

D) $2\log_b 7x$

47A. Solve the inequality. Write your answer in interval notation.

$$\frac{x-2}{x} \leq 0$$

47B. Solve the inequality.

$$\frac{x+1}{x-3} \geq 0$$

A) $(-\infty, -1] \cup (3, \infty)$

B) $(-\infty, -1) \cup [3, \infty)$

C) $[-1, 3)$

D) $[-1, \infty)$

48A. Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$ to find how long it takes a \$1200 investment to earn \$200 interest if it is invested at 9% interest compounded quarterly. Round your answer to the nearest tenth of a year.

_____

48B. Use the formula $A = Pe^{rt}$ to find how long it would take for \$1600 to grow to \$2509 when compounded continuously at 9% interest.

A) 1.6 years

B) 1.0 years

C) 0.5 years

D) 5.0 years

49A. Use the formula $A = Pe^{rt}$ to find the amount owed at the end of 5 years if \$1000 is borrowed at a rate of 6% compounded continuously, rounded to the nearest cent.

_____

49B. Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$ to find the amount owed at the end of 10 years if \$16,000 is borrowed at a rate of 5% compounded monthly.

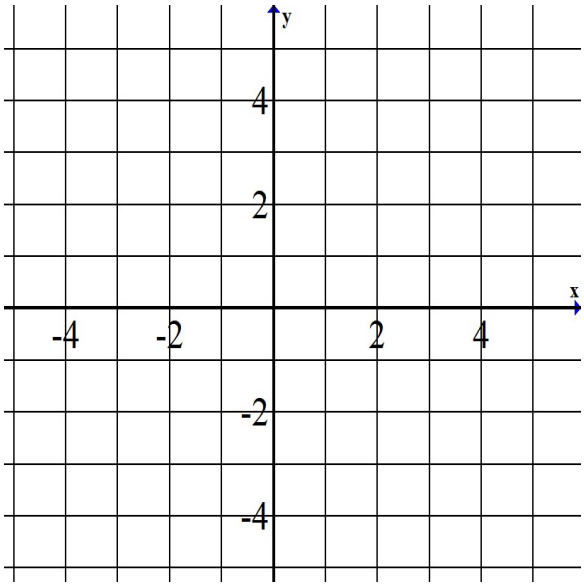
A) \$168,185.90

B) \$26,062.31

C) \$26,352.15

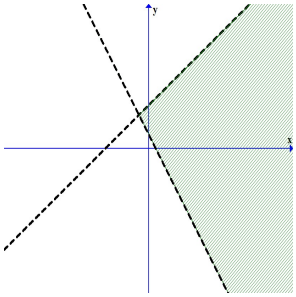
D) \$26,297.91

50A. Graph the solution set to the system $\begin{cases} y < 2x + 2 \\ y \geq -x - 1 \end{cases}$

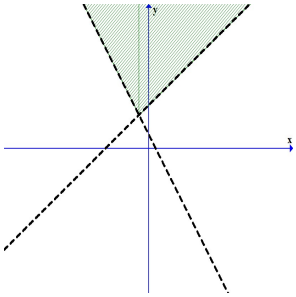


50B. Select the solution set to the system $\begin{cases} y > x + 3 \\ y < -2x + 1 \end{cases}$

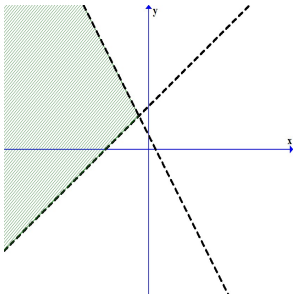
A)



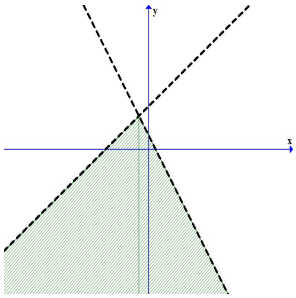
C)



B)

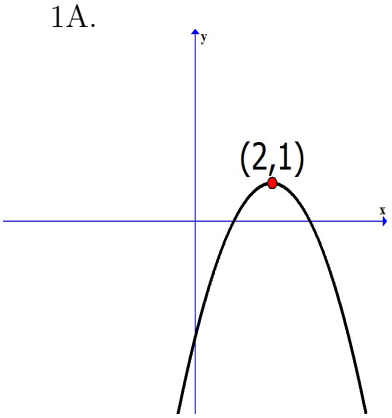


D)



Answer Key:

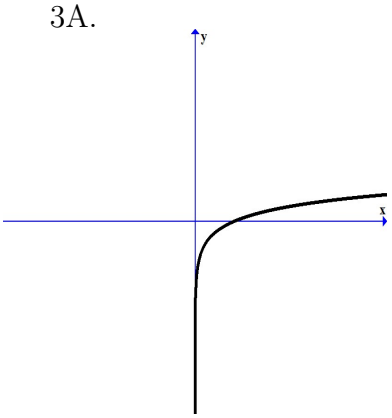
1A.



1B. B

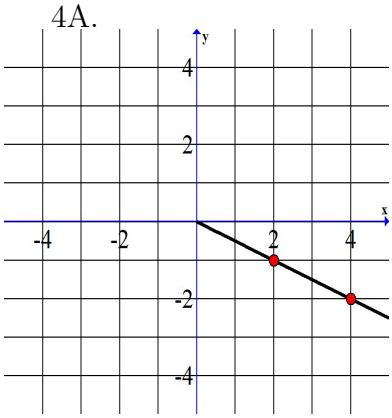
2A. Down, $(-1, 4)$
2B. A

3A.



3B. A

4A.



4B. B

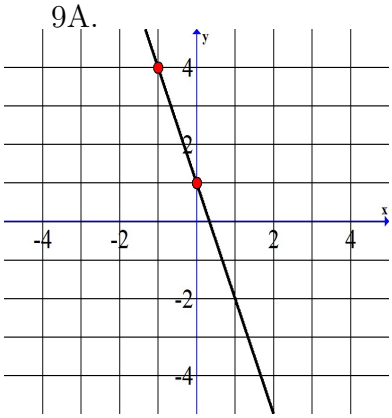
5A. $x = 7$
5B. A

6A. $x = \frac{4}{3}$
6B. D

7A. $x = 3$, $x = -2$
7B. A

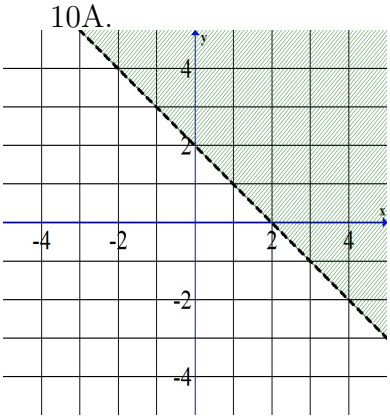
8A. $x = \dfrac{e^2 + 5}{3}$
8B. A

9A.



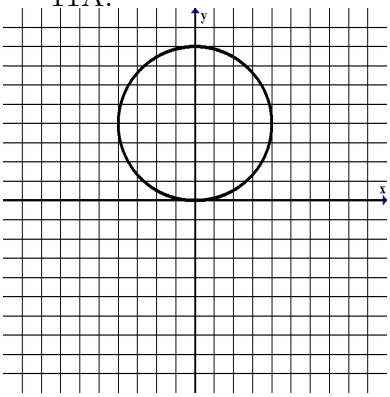
9B. B

10A.



10B. C

11A.



Center=(0,4), Radius=4

11B. B

12A. Left 2, Down 3

12B. D

13A. $f(x) = -\frac{3}{4}x + 3$

13B. D

14A. $x = 0$, $x = -4$

14B. D

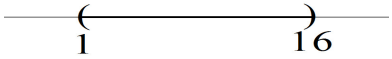
15A. $(f \circ g)(x) = x^2$
$(g \circ f)(x) = x^2 + 2x$

15B. D

16A. $(f + g)(x) = 4x^2 + 2x - 12$
$(f - g)(x) = 4x^2 - 2x - 6$
$(f \cdot g)(x) = 8x^3 - 12x^2 - 18x + 27$
$\left(\frac{f}{g}\right)(x) = 2x + 3,\ x \neq \frac{3}{2}$

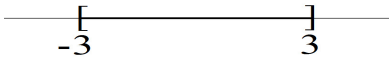
16B. C

17A.



17B. C

18A.



18B. C

19A. $t = 18$, $t = -24$

19B. B

20A. $\left[-\frac{1}{2}, 3\right]$

20B. D

21A. $x = 7 \pm \sqrt{57}$

21B. C

22A. B

22B. A

22C. D

23A. 18 and 7

23B. B

24A. Yes. Each x value corresponds to a unique y value and each y value corresponds to a unique x value.

24B. C

25A. $f^{-1}(x) = 7x + 3$

25B. B

26A. $-\frac{1}{5}$
26B. C

27A. 7.2 ft
27B. B

28A. $\sqrt{34}$
28B. D

29A. I. 7500 II. 2026
29B. B

30A. 28cm^3
30B. C

31A. 7.14
31B. B

32A. $-4m^4$
32B. D

33A. $27y\sqrt{3xy}$
33B. C

34A. $7\sqrt{x} - x\sqrt{7}$
34B. D

35A. $2 - \sqrt{3}$
35B. B

36A. I. 31 mph II. 250 ft
36B. A

37A. $\dfrac{4x^5z^2}{y}$
37B. A

38A. $y - 4y^{1/2} - 12$
38B. C

39A. 9.5%
39B. B

40A. $x = \dfrac{-1 \pm i\sqrt{7}}{2}$
40B. B

41A. 10 mph
41B. B

42A. $(-\infty, -1] \cup [2, \infty)$
42B. D

43A. $(-5, -6)$
43B. D

44A. $(1, 2, 3)$
44B. B

45A. $\frac{1}{6} = 6^{-1}$
45B. B

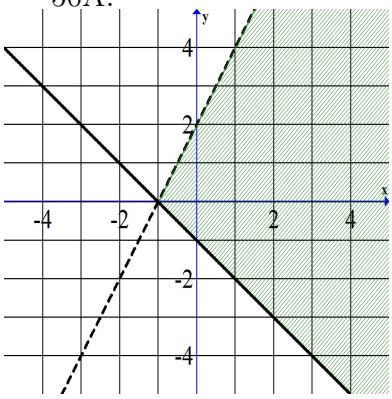
46A. $\log_6 4$
46B. C

47A. $(0, 2]$
47B. A

48A. 1.7 years
48B. D

49A. \$1349.86
49B. C

50A.



50B. B