Midterm Review 2016-2017

Name:_____

Date: _____ Hour:_____

1. Solve the following equations for the indicated variable.

a) $x - y = -4$, for y

$-x \quad -x$

$-y = -x - 4$

$\frac{-y}{-1} = \frac{-x}{-1} - \frac{4}{-1}$

$y = x + 4$

b) $7A + 8B = 24$, for B

$-7A \quad -7A$

$\frac{8B}{8} = \frac{-7A}{8} + \frac{24}{8}$

$B = -\frac{7}{8}A + 3$

c) $6f - 7d = 28$, for f

$+7d \quad +7d$

$\frac{6f}{6} = \frac{7d}{6} + \frac{28}{6}$

$f = \frac{7}{6}d + \frac{14}{3}$

d) $11p - 6r = 24$, for p

$+6r \quad +6r$

$\frac{11p}{11} = \frac{6r}{11} + \frac{24}{11}$

$p = \frac{6}{11}r + \frac{24}{11}$

2. Sam needs to buy breakfast for his study group. The equation $0.80x + 1.50y = 12$ models how much money he will spend on bagels and muffins. Let x = number of bagels and y = muffins.

a) If this equation were graphed, what would be the x-intercept? The y-intercept?

$y = 0$: $.80x + 0 = 12$, $x = 15$, (15,0)

$x = 0$: $0 + 1.50y = 12$, $y = 8$, (0,8)

b) What would the x-intercept represent? What would the y-intercept represent?

Sam buying 15 bagels + 0 muffins

Sam buying 0 bagels + 8 muffins

3. Sam needs to buy breakfast for his study group. The equation $0.80x + 1.50y \leq 12$ models how much money he will spend on bagels and muffins. Let x = number of bagels and y = muffins Which statement below is true?

Sam will purchase 12 items.

Sam will spend at most $12.

Bagels

~~Paintbrushes~~ are on sale for 20% off.

Sam can purchase 2 ~~paintbrushes~~ and 8 ~~paint tubes~~.

Bagels muffins

4. Georgia needs to buy craft supplies. The equation $0.75x + 2.25y \leq 20$ models how much money she will spend on glue sticks and glitter pens. Let x = number of glue sticks and y = number of glitter pens. Tell what each component of the equation means in context.

0.75x: # of Glue Sticks times cost (75¢)

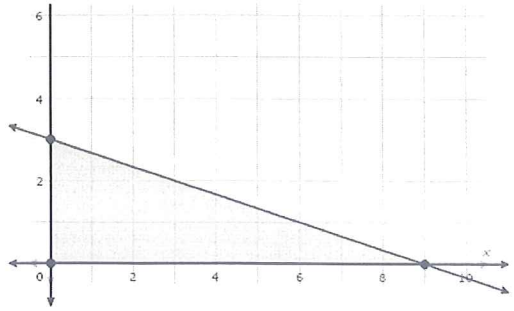
2.25y: # of Glitterpens times cost ($2.25)

20: The most she can spend $20

≤: The cost needs to be less than or = to $20

5. Which of the following inequalities is NOT a constraint for the solution region shown?

a) a) $x \geq 0$ b) $y \geq 0$ c) $x + 3y \leq 9$ d) $x - 3y \geq 9$



$-x \quad -x$

$\frac{3y}{3} \leq \frac{-x}{3} + \frac{9}{3}$

$y \leq \frac{-1}{3}x + 3$

$-x \quad -x$

$\frac{-3y}{-3} \geq \frac{-x}{-3} + \frac{9}{-3}$

$y \leq \frac{1}{3}x - 3$

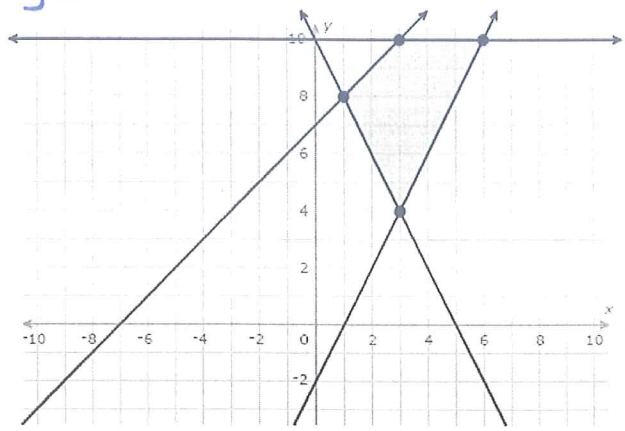
flip sign!!

6. Which of the following inequalities is NOT a constraint for the solution region shown?

a) $2x + y \geq 10$ ✓ b) $x \leq 10$ ✓ c) $x - y \geq -7$ ✓ d) $2x - y \geq 2$

$-2x \quad -2x$

$y \geq -2x + 10$



$-x \quad -x$

$\frac{-y}{-1} \geq \frac{-x}{-1} - \frac{7}{-1}$

$y \leq x + 7$

flip sign!!

$-2x \quad -2x$

$\frac{-y}{-1} \geq \frac{-2x}{-1} + \frac{2}{-1}$

$y \leq 2x - 2$

flip sign!!

7. MJR is selling Movie tickets. The theater must sell at least 200 student tickets. The theater must sell at least 150 adult tickets. The theatre will hold 850 people.

What are the constraints for this scenario?

x: student tix

y: adult tix

$x \geq 200$

$y \geq 150$

$x + y \leq 850$

8. Sally is in the band and is selling bagels for $2.00 and slices of pie for $3.50. She has a goal of selling $28 worth so she can attend the field trip to the Detroit Symphony Orchestra. Graph this inequality

x : bagels
y : pie slices

$2x + 3.50y \geq 28$

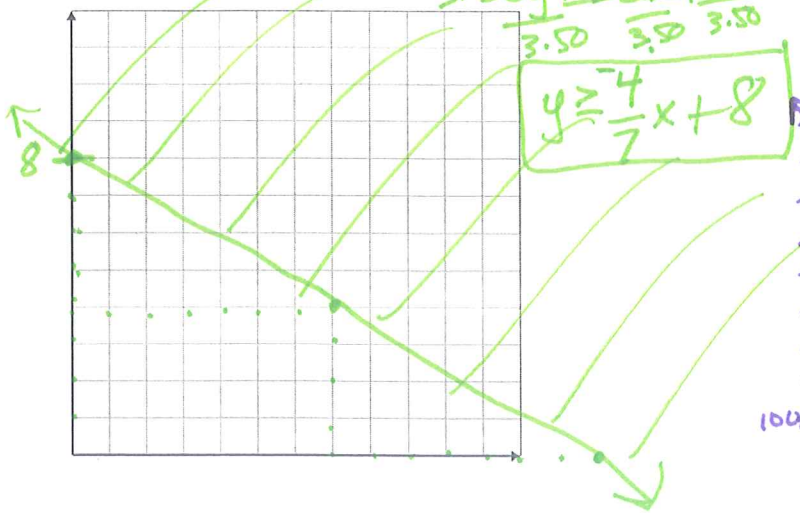
$-2x \quad -2x$

$3.50y \geq -2x + 28$

$\frac{3.50y}{3.50} \geq \frac{-2x}{3.50} + \frac{28}{3.50}$

$y \geq \frac{-4}{7}x + 8$

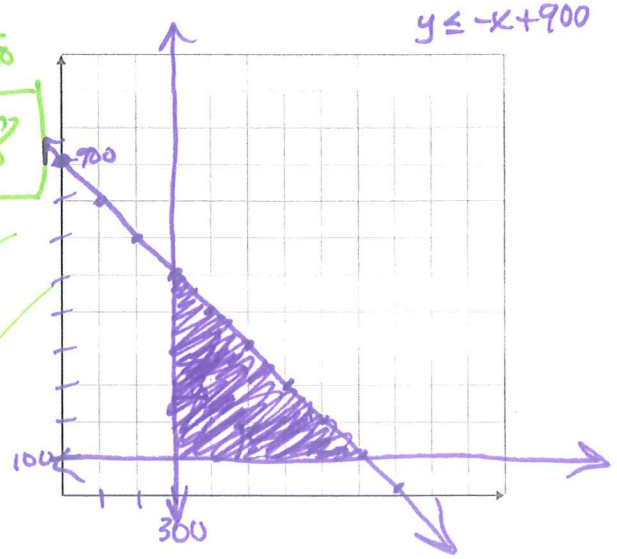
* math enter enter



9. The theater department is selling tickets to the musical. They must sell at least 300 student tickets and at least 100 adult tickets. The auditorium will hold 900 people. Graph the following constraints.

$x \geq 300$ $\quad y \geq 100$ $\quad x + y \leq 900$

$y \leq -x + 900$



10. Juan makes two types of wood clocks to sell at local stores.

a) It take him 2 hours to assemble a pine clock, and 2 hours to assemble an oak clock. Juan has 20 hours that he can work on clocks.

$2x + 2y \leq 20$

b) A pine clock requires 1oz of varnish, and an oak clock requires 4oz of varnish. Juan has 16oz of varnish in stock.

$1x + 4y \leq 16$

c) Let x = pine clocks, and y = oak clocks.

d) What are the two constraints?

$2x + 2y \leq 20$

$1x + 4y \leq 16$

e) Graph the constraints.

$2x + 2y \leq 20$

$-2x \quad -2x$

$\frac{2y}{2} \leq \frac{-2x}{2} + \frac{20}{2}$

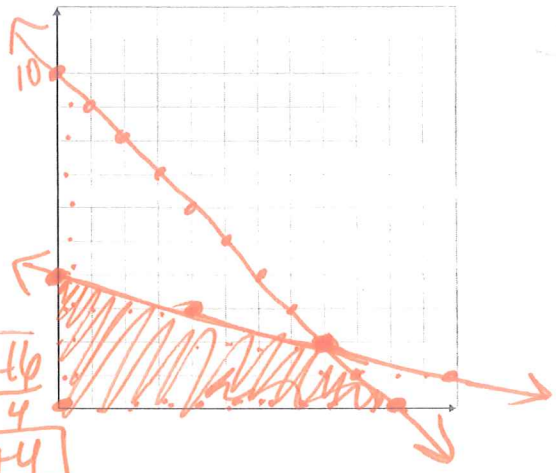
$y \leq -1x + 10$

$1x + 4y \leq 16$

$-1x \quad -1x$

$\frac{4y}{4} \leq \frac{-1x}{4} + \frac{16}{4}$

$y \leq -\frac{1}{4}x + 4$



f) If he make $3 profit on each pine clock and $4 profit on each oak clock. Use the function f(x, y) = 3x + 4y to determine how many of each type he should make to maximize his profit?

(0,0) → $0

(0,4) → $16

(10,0) → $30

(8,2) → $32

Solve the following systems using either substitution or elimination (addition/subtraction).

11. $x - 4y = 8$
$x - y = -4$

Subst: $x = 4y + 8 = 4(-4) + 8$
$(4y+8) - y = -4$
$3y + 8 = -4$
$-8 \quad -8$
$3y = -12$
$y = -4$
$x = -16 + 8$
$x = -8$
$(-8, -4)$

12. $12x + 5y = 45$
$-12x + 5y = +5$
$0 \neq 40$
No Solution
Elimination

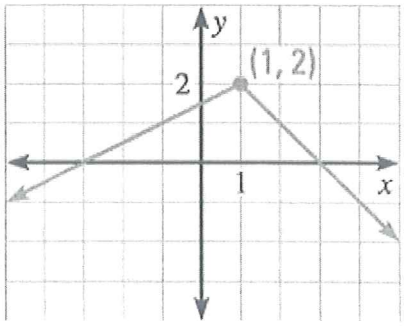
13. $x - y = -5$ $\cdot(-5) \rightarrow -5x + 5y = 25$
$5x + 3y = -9 \rightarrow 5x + 3y = -9$
Elim.
$8y = 16$
$y = 2$
$x - (2) = -5$
$+2 \quad +2$
$x = -3$
$(-3, 2)$

14. $10x + 6y = 18 \rightarrow 10x + 6y = 18$
$(5x + 3y = 9) \cdot -2 \quad -10x - 6y = -18$
Elim
$0 = 0$
Infinitely Many Soln's

15. $3x - 2y = 14$ $\cdot 2 \rightarrow 6x - 4y = 28$
$5x + 4y = 16 \rightarrow 5x + 4y = 16$
Elim
$11x = 44$
$x = 4$
$3(4) - 2y = 14$
$12 - 2y = 14$
$-12 \quad -12$
$-2y = 2$
$y = -1$
$(4, -1)$

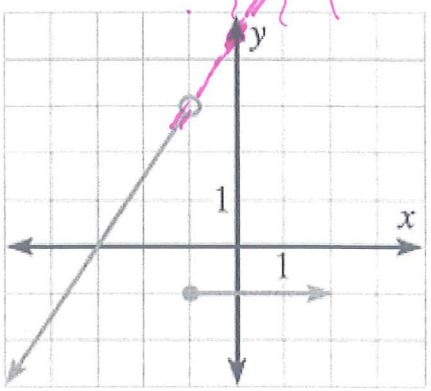
16. $11x - y = 5$
$x - y = -5$
Subst
$+y \quad +y$
$x = y - 5$
$11(y-5) - y = 5$
$11y - 55 - y = 5$
$10y - 55 = 5$
$+55 \quad +55$
$\frac{10y}{10} = \frac{60}{10}$
$y = 6$
$x = 6 - 5$
$x = 1$
$(1, 6)$

17. Fill in the missing interval for the piecewise function.



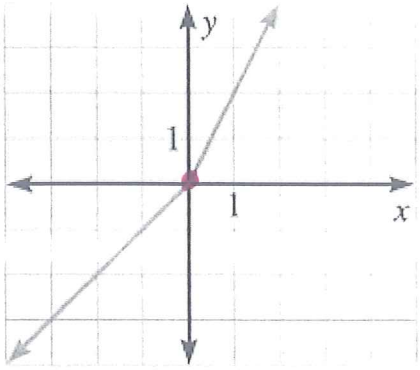
$$f(x) = \begin{cases} \frac{1}{2}x + \frac{3}{2}, & \text{if } x \leq 1 \\ -x + 3, & \text{if } x \geq 1 \end{cases}$$

18. Write the equation of each piecewise function.



$y = -\frac{3}{2}x + 4.5, \quad x < -1$

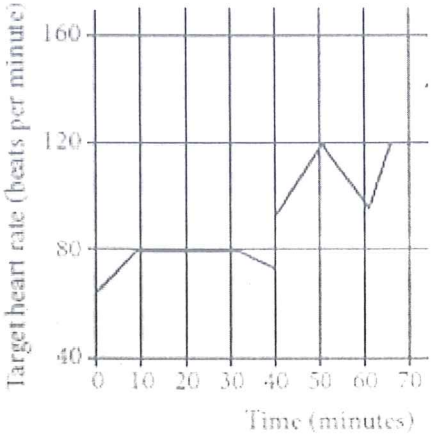
$y = -1, \quad x \geq -1$



$y = 2x, \quad x \geq 0$

$y = -x, \quad x \leq 0$

19. On which intervals is John's target heart rate strictly increasing?



$0 \leq x \leq 10$

$40 \leq x \leq 50$

$61 \leq x \leq 65$

20. Solve the system below by graphing.

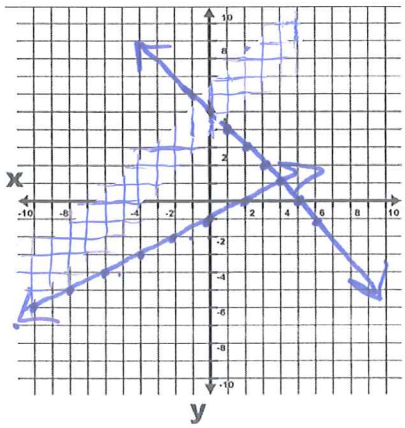
$x + y = 5$

$2y = x - 2$

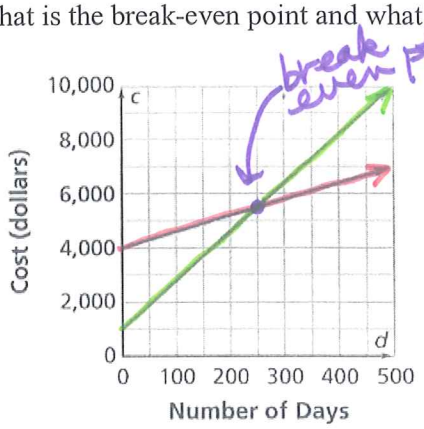
$y = -x + 5$

$y = \frac{1}{2}x - 1$

(4, 1)



21. Write a scenario, using the graph below, for two companies' services. Be sure to include which company would be a better buy before the break-even point, and which company would be a better buy after the break-even point. Also, what is the break-even point and what does it mean?



- answers will vary

better buy before: green line
better buy after: red line

*better buy means less money!!

22. Consider the system of equations below. What multipliers would you use on both equations if you wanted to eliminate the x terms? What multipliers would you use on both equations if you wanted to eliminate the y terms?

X $\begin{cases} 5x + 2y = 10 \\ 3x - 4y = 12 \end{cases}$ 3, -5

just 1 of them needs to be negative

y $\begin{cases} 5x+2y=10 \\ 3x-4y=12 \end{cases}$ 2, 1

23. Alex buys 6 Power Bars and 2 jars of Creatine for a total of $128.00. Nicko buys just 2 Power Bars but buys 4 jars a Creatine for a total of $76.00. How much does each product cost?

$(6B+2J=128)\ -2 \rightarrow -12B-4J=-256$
$2B+4J=76 \rightarrow 2B+4J=76$
$-10B = -180$
$B=18$

$2(18)+4J=76$
$-36 \quad -36$
$4J=40$
$J=10$

18 PowerBars
10 Creatine

24. John has 20 meal coupons for McDonalds and Burger King.
a) McDonald's coupons are worth $2 and Burger King's coupons are worth $2.50.
b) He has a total of $44 worth of coupons, find the number of McDonald's coupons John has.

$(m+B=20)\ -2 \rightarrow -2m-2B=-40$
$2m+2.5B=44 \rightarrow 2m+2.50B=44$
$+.5B=4$
$B=8$

$m+8=20$
$m=12$

12 McDon.
8 B.K.

25. Write a system of Linear equations, in slope intercept form, for each of the scenarios, and sketch a graph:

Exactly one solution
$x-4y=8$
$x-y=-4$

No solution
$12x+5y=45$
$12x+5y=-5$

Infinitely many solutions
$10x+6y=18$
$5x+3y=9$

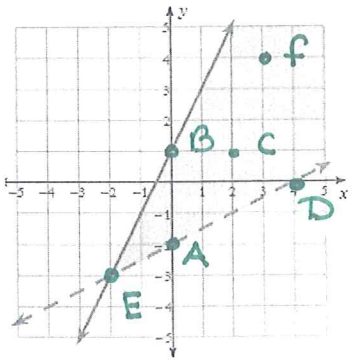
Exactly two solutions
Will NEVER Happen!!
(unless 1 is a Quadratic)

Answers will vary!

Key

26. Using the graph of a system of inequalities below, determine if the ordered pairs fall in the solution set or not (yes or no).

a) (0, -2) no
b) (0, 1) yes
c) (2, 1) yes
d) (4, 0) no
e) (-2, -3) yes
f) (3, 4) yes



27. Tell if the following matrices can be multiplied and if they can what is the dimension of their product.

Matrices	Can you Multiply?	Dimension of product
a) $[A]$ 2 x 3 $[B]$ 3 x 4	yes	2×4
b) $[A]$ 2 x 3 $[B]$ 2 x 2	$3 \neq 2$ no	
c) $[A]$ 3 x 3 $[B]$ 3 x 4	yes	3×4
d) $[A]$ 5 x 5 $[B]$ 5 x 5	yes	5×5

28. Write a matrix for the given information.

A) Make a 3 x 3 Matrix

Taco Bell Store Sales:
Store #1 Burritos 20, Tacos 76, Drinks 12
Store #2 Burritos 35, Tacos 53 Drinks 18
Store #3 Burritos 24, Tacos 60, Drinks 21

	Burr.	Tacos	Drinks
#1	20	76	12
#2	35	53	18
#3	24	60	21

B) Make a 2 x 3 Matrix

Bakery Inventory:
Store #1 Donuts 34 Muffins 45
Store #2 Donuts 13 Muffins 55
Store #3 Donuts 31 Muffins 4

	#1	#2	#3
Donuts	34	13	31
Muffins	45	55	4

29. $\begin{bmatrix} 4 & -1 \\ 2 & -5 \end{bmatrix} \cdot \begin{bmatrix} 9 & -8 & 1 \\ 2 & -4 & -6 \end{bmatrix}$, if possible.

$\begin{bmatrix} 34 & -28 & 10 \\ 8 & 4 & 32 \end{bmatrix}$

30. $\begin{bmatrix} 2 & -3 \\ 4 & -5 \end{bmatrix} \begin{bmatrix} a & 2 & -5 \\ 0 & b & c \end{bmatrix}$

$\begin{bmatrix} 2a & 4-3b & -10-3c \\ 4a & 8-5b & -20-5c \end{bmatrix}$

31. $\begin{bmatrix} 3 & -1 \\ 0 & 5 \end{bmatrix} \begin{bmatrix} a & 3 \\ c & -b \end{bmatrix}$

$\begin{bmatrix} 3a-c & 9+b \\ 5c & -5b \end{bmatrix}$

Key

32. What is the identity for a 2 x 2 matrix? For a 3 x 3 matrix? For a 4 x 4 matrix? $\begin{bmatrix}1&0\\0&1\end{bmatrix}$ $\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}$

33. How can you tell if two matrices are inverses? $[A]\cdot[A]^{-1}=[I]$

34. What do you know about the product of $[A]\cdot[A]^{-1}$ = The Identity Matrix

35. Solve the matrix equation $\begin{bmatrix}-2&4\\-1&3\end{bmatrix}\cdot\begin{bmatrix}x\\y\end{bmatrix}=\begin{bmatrix}5\\4\end{bmatrix}$ by using inverse matrices.

$\begin{bmatrix}x\\y\end{bmatrix}=\begin{bmatrix}-2&4\\-1&3\end{bmatrix}^{-1}\begin{bmatrix}5\\4\end{bmatrix}$ (1/2, 3/2)

36. Solve the matrix equation $\begin{bmatrix}6&-8\\-1&3\end{bmatrix}\cdot\begin{bmatrix}x\\y\end{bmatrix}=\begin{bmatrix}-7\\2\end{bmatrix}$ by using inverse matrices.

$\begin{bmatrix}x\\y\end{bmatrix}=\begin{bmatrix}6&-8\\-1&3\end{bmatrix}^{-1}\begin{bmatrix}-7\\2\end{bmatrix}$ (-1/2, 1/2)

37. Write a matrix equation for the following system of equations

3f − 2g = 7 and −2f + g = -5? $\begin{bmatrix}3&-2\\-2&1\end{bmatrix}\begin{bmatrix}f\\g\end{bmatrix}=\begin{bmatrix}7\\-5\end{bmatrix}$

38. Write a matrix equation for the following system of equations
5m – 2n = 13 and −m + n = −2? $\begin{bmatrix}5&-2\\-1&1\end{bmatrix}\begin{bmatrix}m\\n\end{bmatrix}=\begin{bmatrix}13\\-2\end{bmatrix}$

39. Write an example of two matrices, and their dimensions, which can be multiplied. Then, write an example of two matrices, and their dimensions, which cannot be multiplied.

40. Simplify

A. $\begin{bmatrix}1&2\\3&4\end{bmatrix}+\frac{1}{3}\begin{bmatrix}3&6\\9&3x\end{bmatrix}=\begin{bmatrix}1&2\\3&4\end{bmatrix}+\begin{bmatrix}1&2\\3&x\end{bmatrix}=\begin{bmatrix}2&4\\6&x+4\end{bmatrix}$

B. $\begin{bmatrix}2&-3\\4&-5\end{bmatrix}-2\begin{bmatrix}2&8a\\4&-6b\end{bmatrix}=\begin{bmatrix}2&-3\\4&-5\end{bmatrix}-\begin{bmatrix}4&16a\\8&-12b\end{bmatrix}=\begin{bmatrix}-2&-3-16a\\-4&-5+12b\end{bmatrix}$

41. Simplify $\sqrt{-200}$. $i\sqrt{100}\sqrt{2}$ $10i\sqrt{2}$

A. $2i\sqrt{10}$ B. $-10i\sqrt{2}$ C. $10i\sqrt{2}$ D. $-2i\sqrt{10}$

42. Simplify $\sqrt{-50}$ $i\sqrt{25}\sqrt{2}$ $\pm 5i\sqrt{2}$

43. Simplify $\sqrt{-27}$ $i\sqrt{9}\sqrt{3}$ $\pm 3i\sqrt{3}$

44. What is the conjugate of $\frac{3}{-2-5i}$ of the denominator? diff of 2 squares

A. $2+5i$ B. $-2+5i$ C. $-2-5i$ D. $\sqrt{-2-5i}$

45. What is the conjugate of $2+2i$? $2-2i$

46. What is the conjugate of $3-4i$? $3+4i$

47. Simplify $(-4i)\bullet(-2i)$

A. $8i$ $8i^2$ $8(-1)$ -8 B. -8 C. $-8i$ D. 8

48. Simplify. ~~YOU MUST SHOW ALL YOUR STEPS!~~ Same probs.

$(2-2i)(1+3i)$ $2+6i-2i-6i^2$ $2+4i-6(-1)$ $8+4i$

$(2-2i)(1+3i)$ $2+6i-2i-6i^2$ $2+4i-6(-1)$ $8+4i$

$(12i)(5i)$ $60i^2$ $60(-1)$ -60

$(-2i)(6i)$ $-12i^2$ $-12(-1)$ 12

Use Quadratic Formula or completing the square to find the exact solutions of the following Quadratics. 256 - 26

49. $2x^2-16x+33=0$. $\frac{-(-16)\pm\sqrt{(-16)^2-4(2)(33)}}{2(2)} = \frac{16\pm\sqrt{-8}}{4} = \frac{16\pm 2i\sqrt{2}}{4} = \frac{8\pm i\sqrt{2}}{2}$

50. $x^2-3x+5=0$ $\left(\frac{-3}{2}\right)^2=\frac{9}{4}$ $x^2-3x=-5$ $-\frac{20}{9}$ $x^2-3x+\frac{9}{4}=-5+\frac{9}{4}$ $(x-\frac{3}{2})^2=-\frac{11}{4}$ $x=\frac{3}{2}\pm\frac{i\sqrt{11}}{2}$ $x=\frac{3\pm i\sqrt{11}}{2}$

51. $x^2+6x+7=0$ $\frac{6}{2}(3)^2$ $x^2+6x=-7$ $x^2+6x+9=-7+9$ $\sqrt{(x+3)^2}=\sqrt{2}$ $x=-3\pm\sqrt{2}$

52. $x^2-7x+8=0$ $\frac{-(-7)\pm\sqrt{(-7)^2-4(1)(8)}}{2(1)} = \frac{7\pm\sqrt{49-32}}{2}$ $\frac{7\pm\sqrt{17}}{2}$

53. Find all of the zeros of the function $f(x) = x^2 + 6x + 13$.

$x^2+6x = -13$

$x^2+6x+9 = -13+9$

$(x+3)^2 = -4$

$x+3 = \pm 2i$

$x = -3 \pm 2i$

A. $-2 + 3i$ and $-2 - 3i$ B. -13 and 0 C. $-3 + 2i$ and $-3 - 2i$ D. No Solution

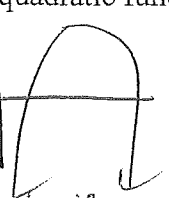
54. What does the value of k have to be in order for the quadratic function to have two real solutions?

$y = -3(x - 5)^2 + k$

$K \geq 0$

You know Parabola is going down

$A = -$



55. Identify the range for $y = 2.5(x + 3)^2 - 2$.

has to be above x-axis.

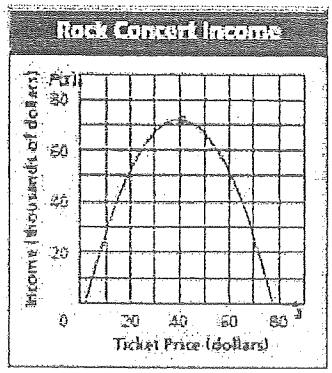
min $a = +$ $(-3, -2)$

A. $y \geq -2$ B. $y \geq 2$ C. $y \leq 2.5$ D. $y \leq 3$

56. Identify the range for $y = -3(x - 5)^2 + 8$

max $(-5, 8)$ R: $y \leq 8$

57. Use the diagram about Rock Concert Income.



a) What is the coordinate of the vertex? (40, 71)

b) Write an equation that could model the graph. Use an a-value of $-\frac{1}{7}$.

$y = -\frac{1}{7}(x - 40) + 71$

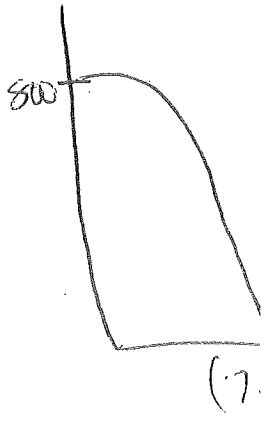
58. A coin is dropped from the top of a building. The height of the coin as it falls is represented by the function $h(t) = -16t^2 + 800$ where h = height above the ground in feet and t = time in seconds.

What is the time when the coin is at its maximum height? Explain how you know.

0, Vertex max is @ (0, 800)

What is the maximum height of the coin? Explain how you know.

800 ft, where it was dropped from



At what time will the coin hit the ground? Explain how you know.

(7.1 secs)

x intercept

59. Write a quadratic equation with -6 and $\frac{3}{4}$ as its roots.
Write the equation in the form $ax^2 + bx + c = 0$, where a, b, and c are integers.

$x = -6 \quad x = \frac{3}{4}$

$x + 6 = 0 \quad x - \frac{3}{4} = 0$

$(x+6) = 0 \quad (4x - 3) = 0$

$(x+6)(4x-3) = 0$

$4x^2 - 3x + 24x - 18 = 0$

$\boxed{4x^2 + 21x - 18 = 0}$

60. Which quadratic equation has roots -2 and 3?

a. $x^2 + x + 6 = 0$ c. $x^2 - 6x + 1 = 0$

b. $x^2 - x - 6 = 0$ d. $x^2 + x - 6 = 0$

$x = -2 \quad x = 3$

$(x+2) = 0 \quad (x-3) = 0$

$(x+2)(x-3) = 0$

$x^2 - 3x + 2x - 6 = 0$

$\boxed{x^2 - x - 6 = 0}$

61. Which quadratic equation has roots -2 and $\frac{1}{5}$?

a. $x^2 + 4x + 4 = 0$ c. $5x^2 - 9x - 2 = 0$

b. $5x^2 + 9x - 2 = 0$ d. $5x^2 - 11x + 2 = 0$

$x = -2 \quad x = \frac{1}{5}$

$(x+2) = 0 \quad x - \frac{1}{5} = 0$

$(5x - 1) = 0$

$(x+2)(5x-1) = 0$

$\boxed{5x^2 - x + 10x - 2 = 0}$

Solve the following systems of a quadratic and a linear equation:

62. $y = x^2 - x - 4$
$y = 2x$

$2x = x^2 - x - 4$

$0 = x^2 - 3x - 4$

$0 = (x-4)(x+1)$

$x = 4 \quad x = -1$

when $x = 4$: $y = 2(4) = 8$ → $(4, 8)$

when $x = -1$: $y = 2(-1) = -2$ → $(-1, -2)$

63. $y = x^2 - 3x + 2$
$y = x - 2$

$x^2 - 3x + 2 = x - 2$

$x^2 - 4x + 4 = 0$

$(x-2)(x-2)$

$x = 2$

when $x = 2$: $y = 2 - 2 = 0$ → $(2, 0)$

64. $y = x^2 - 5x + 11$
$y = 2x + 1$

$2x + 1 = x^2 - 5x + 11$

$0 = x^2 - 7x + 10$

$0 = (x-5)(x-2)$

$x = 5 \quad x = 2$

when $x = 5$: $y = 2(5) + 1$, $y = 11$ → $(5, 11)$

when $x = 2$: $y = 2(2) + 1 = 5$ → $(2, 5)$

65. Write an equation for a quadratic in the form $y = (x - h)^2 + k$ that has a vertex at…

a) (1, -7) $y = (x-1)^2 - 7$

b) (2, 4) $y = (x-2)^2 + 4$

c) (-1, 7) $y = (x+1)^2 + 7$

d) (-2, -3) $y = (x+2)^2 - 3$

e) (0, 3) $y = x^2 + 3$

Use complete the square to write the standard form of the parabolas below.

66. $f(x) = x^2 + 2x + 4$

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

$\frac{b}{2} = \frac{2}{2} = 1$ $f(x) - 4 + 1 = x^2 + 2x + 1$

$(\frac{b}{2})^2 = 1$ $f(x) - 3 = (x+1)^2$

$f(x) = (x+1)^2 + 3$

67. $f(x) = x^2 + 4x - 4$

$f(x) + 4 = x^2 + 4x$

$\frac{b}{2} = \frac{4}{2} = 2$ $(\frac{b}{2})^2 = 2^2 = 4$

$f(x) + 4 + 4 = x^2 + 4x + 4$

$f(x) + 8 = (x+2)^2$

$f(x) = (x+2)^2 - 8$

68. $f(x) = x^2 - 14x + 1$

$f(x) - 1 = x^2 - 14x$

$\frac{b}{2} = \frac{-14}{2} = -7$ $(\frac{b}{2})^2 = (-7)^2 = 49$

$f(x) - 1 + 49 = x^2 - 14x + 49$

$f(x) + 48 = (x-7)^2$

$f(x) = (x-7)^2 - 48$

69. Identify the center and the radius of the following circles.

a) $(x-2)^2 + (y+3)^2 = 25$ center $(2, -3)$ radius 5

b) $x^2 + (y+5)^2 = 81$ center $(0, -5)$ radius 9

c) $(x-2)^2 + (y+3)^2 = 49$ center $(2, -3)$ radius 7

d) $(x-3)^2 + y^2 = 36$ center $(3, 0)$ radius 6

Use complete the square to write the standard form of the circles below.

70. $x^2 + 2x + y^2 - 6y = 4$

$x^2 + 2x + 1 + y^2 - 6y + 9 = 4 + 1 + 9$

$(x+1)^2 + (y-3)^2 = 14$

71. $x^2 - 6x + y^2 - 8y = 4$

$x^2 - 6x + 9 + y^2 - 8y + 16 = 4 + 9 + 16$

$(x-3)^2 + (y-4)^2 = 29$

72. $x^2 + 8x + y^2 - 6y = 1$

$x^2 + 8x + 16 + y^2 - 6y + 9 = 1 + 16$

$(x+4)^2 + (y-3)^2 = 26$