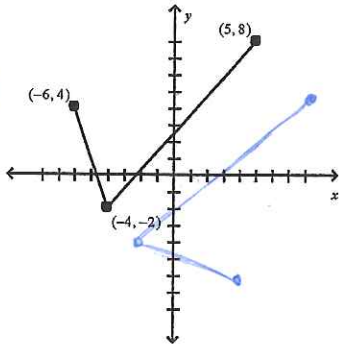
Fall 2014 Semester Review

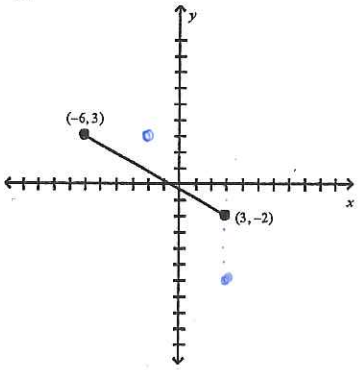
1. Draw the inverse relations of the line segment or figure shown below. (switch x + y)

A



(4, −6)
(−2, −4)
(8, 5)

B.



(3, −6)
(−2, 3)

2. Factor completely.

a) $x^2 - 4x - 21$ $(x-7)(x+3)$

b) $x^2 + 7x + 10$ $(x+2)(x+5)$

c) $x^2 - 16$ $(x+4)(x-4)$

3. Factor completely.

a) $2x^2 - x - 10$ $(2x-5)(x+2)$

b) $3x^2 + 14x - 5$ $(3x-1)(x+5)$

c) $2x^2 + 3x + 1$ $(2x+1)(x+1)$

4. The perimeter of a rectangular garden is 96m. Twice the width of the garden is 3 meters less than its length. Which system of equations could be used to find the length (L) and the width (W) of the garden?

A. $2L+2W = 96$, $2W - L = -3$

B. ~~$L + W = 48$~~, $2W - L = 3$

C. ~~$2L + 2W = 48$~~, $2W - L = -3$

D. $2W + 2L = 96$, $2W - L = 3$

$2L + 2W = 96$
$2W = L - 3$

5. Write each ordered pair with the system of equations for which it is a solution:

(2,3) (4,−1) (8,6) (1,4)

$x+y=3$ $2x+y=7$ (4,−1)	$x+y=5$ $3x-2y=0$ (2,3)	$x-y=2$ $2x+y=22$ (8,6)	$x+y=5$ $2x+y=6$ (1,4)
$(4)+(-1)=3$ ✓ $2(4)+(-1)=7$ $8-1=7$ ✓	$(2)+(3)=5$ ✓ $3(2)-2(3)=0$ $6-6=0$ ✓	$(8)-(6)=2$ ✓ $2(8)+(6)=22$ $16+6=22$ ✓	$(1)+(4)=5$ ✓ $2(1)+(4)=6$ $2+4=6$ ✓

6. Find the solution to the systems of equations using both elimination and by setting up a matrix and solving. Write your answers as ordered pairs.

A. $4x + 3y = 6$
$x - 3y = 9$
$5x = 15$
$x = 3$

$3 - 3y = 9$
$-3y = 6$
$y = -2$

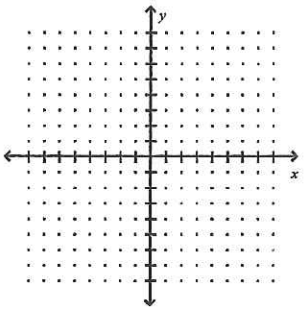
B. ~~$-5x + y = 2$~~
$5x - 3y = 4$
$-2y = 2$
$y = -1$

$5x + 1 = 2$
$5x = 1$
$x = \frac{1}{5}$

7. Create the graph to match the data in the table.

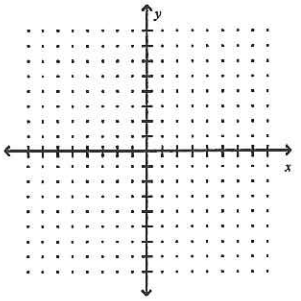
a.

x	y_1	y_2
−4	−3	−3
−2	1	−2
0	5	−1
2	9	0



b.

x	y_1	y_2
−1	1	8
0	3	5
1	5	2
2	7	−1

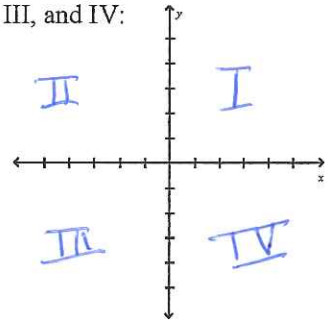


8. At a student bake sale, cakes sold for \$4 each and pies sold for \$5 each. The students sold a total of 75 cakes and pies and made \$340. Write a pair of equations representing this situation.

$4c + 5p = 340$

$c + p = 75$

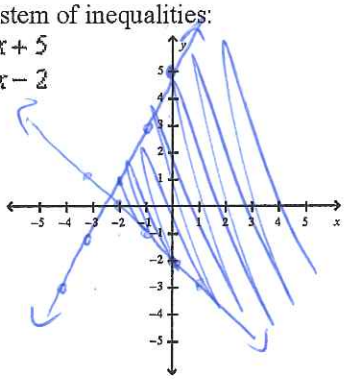
9. a. Label the 4 quadrants as I, II, III, and IV:



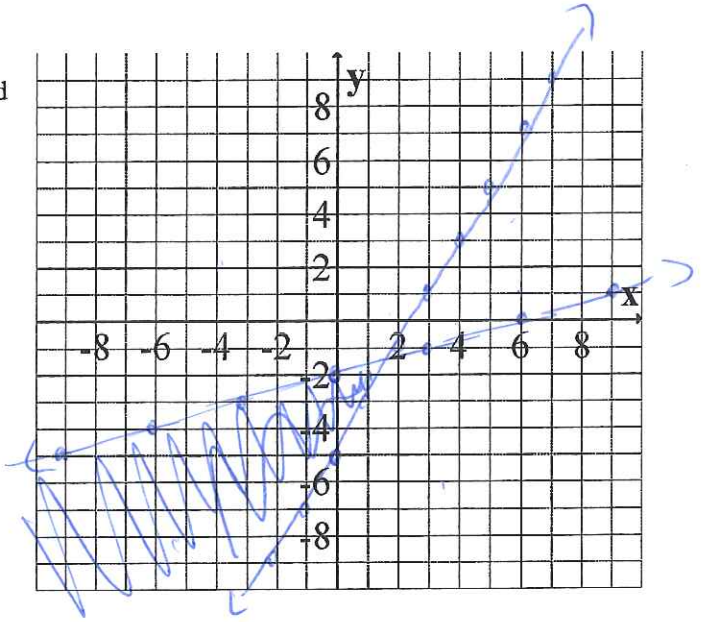
b. Graph the system of inequalities:

$y \le 2x + 5$

$y \ge -x - 2$

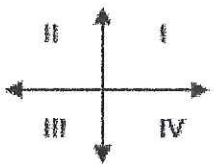


10. Graph the inequalities $y \ge 2x - 5$ and $y \le \frac{1}{3}x - 2$ and copy your results on the graph on the right.



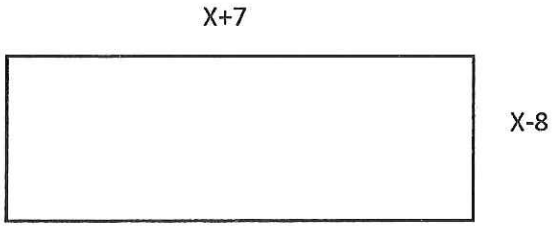
In which quadrant(s) contains parts of the solution to this system of equations?

HINT:



III, IV

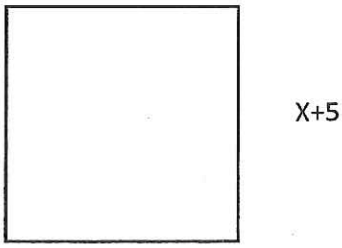
11. A. Find the area of the rectangle.



$(x+7)(x-8)$

$x^2 - x - 56$

B. Find the area of the square.



$x^2 + 10x + 25$

12. Find the solutions of the following 2 functions on your calculator.

$y = 2x + 2$ and $y = 2x^2 - 5x + 5$

(3, 8)

(.5, 3)

13. Find the solution set for each of the following:

a) $|x+3| = 7$

$x+3=7$ $x+3=-7$

$x=4$ $x=-10$

b) $|x-4| = 5$

$x-4=5$ $x-4=-5$

$x=9$ $x=-1$

c) $|x+9| = 20$

$x+9=20$ $x+9=-20$

$x=11$ $x=-29$

14. Describe the transformation from the parent function $y=|x|$ to $y=2|x+1|-7$.

Vertical stretch/shrink of 2. Shift left/right 1 units. Shift up/down 7 units.

15. Describe the transformation from the parent function $y=|x|$ to $y=2|x+9|+17$.

Vertical stretch/shrink of 2. Shift left/right 9 units. Shift up/down 17 units.

16. Describe the transformation from the parent function $y=|x|$ to $y=3|x-2|+6$.

Vertical stretch/shrink of 3. Shift left/right 2 units. Shift up/down 6 units.

17. **There are several ways to solve systems of linear equations: graphing, substitution, elimination, and matrices. Solve the following 4 problems using each method one and only one time. Show your work.**

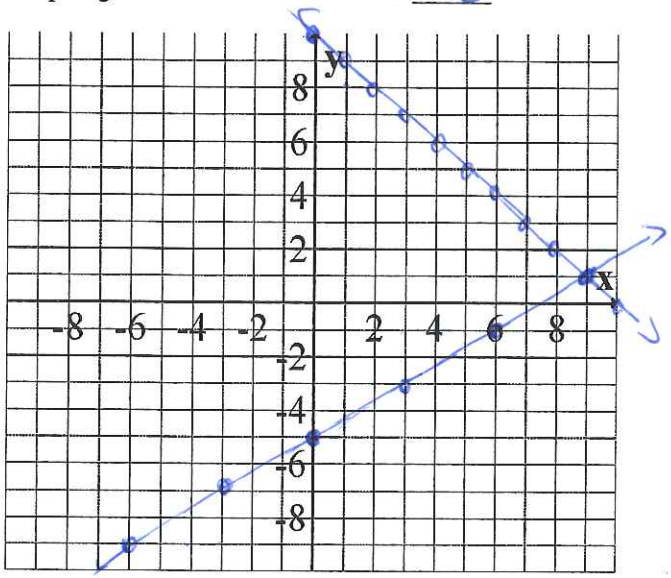
a. $5(5x-3y=-28)$, $3(2x+5y=26)$

b. $2x-5y+z=18$, $4x+3y-2z=2$, $x+7y+3z=-5$

c. $y=5x+3$, $3x-4y=22$

d. $y=\frac{2}{3}x-5$, $y=-x+10$

Graphing Letter d



(9, 1)

Substitution Letter c

$3x-4(5x+3)=22$

$3x-20x-12=22$

$-17x-12=22$

$+12 \quad +12$

$\frac{-17x}{-17}=\frac{34}{-17}$

$x=-2$

$y=5(-2)+3$

$y=-10+3$

$y=-7$

(-2, -7)

Elimination Letter a

$25x-15y=-140$

$6x+15y=78$

$\frac{31x}{31}=\frac{-62}{31}$

$x=-2$

$5(-2)-3y=-28$

$-10-3y=-28$

$+10 \quad +10$

$\frac{-3y}{-3}=\frac{-18}{-3}$

$y=6$

(-2, 6)

Matrices Letter b

$\begin{bmatrix}2&-5&1\\4&3&-2\\1&7&3\end{bmatrix}\cdot\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}18\\2\\-5\end{bmatrix}$

(3, -2, 2)

18. Solve using matrices on your calculator. Show the your matrix equation.

$3c+2b=3$

$a-4c=6$

$4b+3c-a=7$

$0a+2b+3c=3$

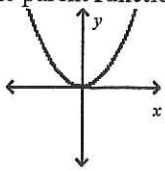
$1a+0b-4c=6$

$-1a+4b+3c=7$

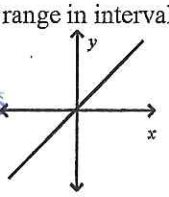
$\begin{bmatrix}0&2&3\\1&0&-4\\-1&4&3\end{bmatrix}\begin{bmatrix}a\\b\\c\end{bmatrix}=\begin{bmatrix}3\\6\\7\end{bmatrix}$

$a=2 \quad b=3 \quad c=-1$

19. Write the parent function equations and state their domain and range in interval notation.

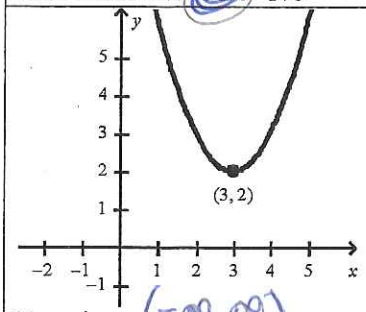
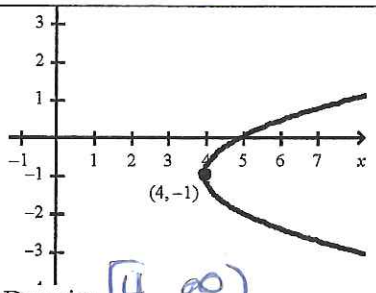
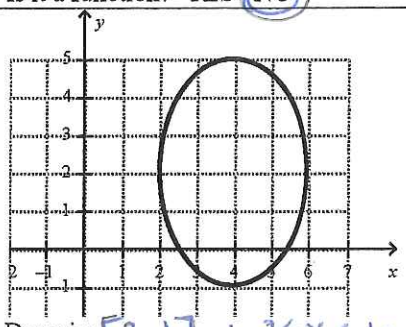
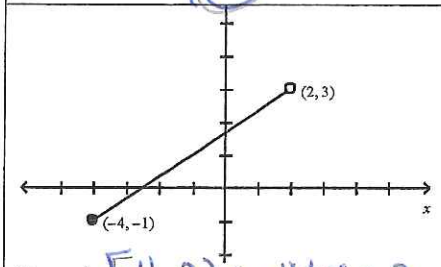
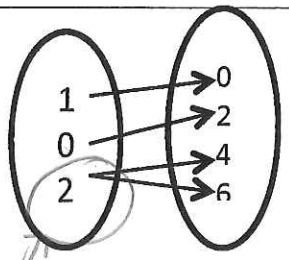
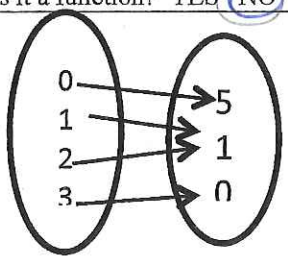
a. 

Quadratic Parent Function:
Equation: $y = x^2$
Domain: $(-\infty, \infty)$; All Reals
Range: $[0, \infty)$; $y \geq 0$

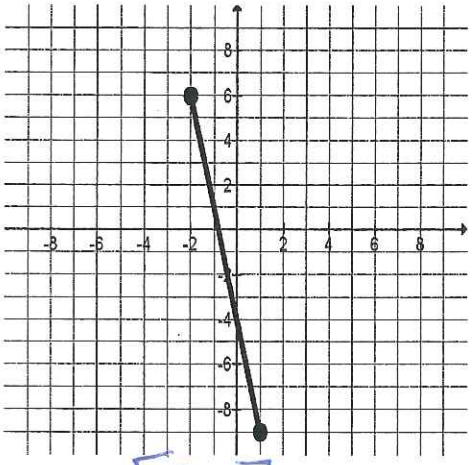
b. 

Linear Parent Function:
Equation: $y = x$
Domain: $(-\infty, \infty)$ > All Reals
Range: $(-\infty, \infty)$

20. Write the domain and range for each of the relations below, and state whether the relation is a function, or not.

$\{(6,6),(7,8),(0,5),(2,3)\}$ Domain: 0, 2, 6, 7 Range: 3, 5, 6, 8 Is it a function? (YES) NO	$f(x) = 2x - 4$ Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$ Is it a function? (YES) NO	not $\{(3,2),(5,3),(2,3),(0,0)\}$ Domain: 0, 2, 5 Range: 0, 2, 3 Is it a function? YES (NO)
 Domain: $(-\infty, \infty)$ Range: $[2, \infty)$; $y \geq 2$ Is it a function? (YES) NO	 Domain: $[4, \infty)$ Range: ~~$x \geq 4$~~ $(-\infty, \infty)$ Is it a function? YES (NO)	 Domain: $[2, 6]$; $2 \leq x \leq 6$ Range: $[-1, 5]$; $-1 \leq y \leq 5$ Is it a function? YES (NO)
 Domain: $[-4, 2)$; $-4 \leq x < 2$ Range: $[-1, 3)$; $-1 \leq y < 3$ Is it a function? (YES) NO	 not Domain: 0, 1, 2 Range: 0, 2, 4, 6 Is it a function? YES (NO)	 Domain: 0, 1, 2, 3 Range: 0, 1, 5 Is it a function? (YES) NO

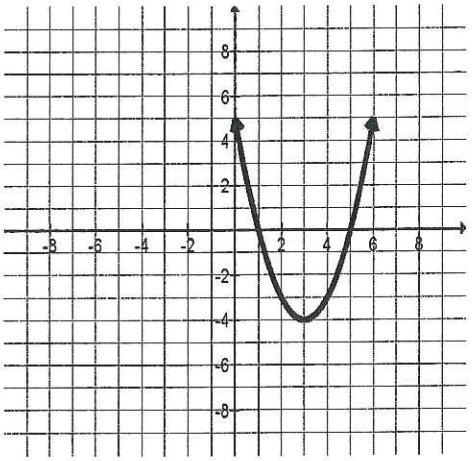
21. Give the domain:



[-2, 1]

a. $-2 \le x \le 1$ b. $-2 < x < 1$ c. $-9 \le x \le 6$

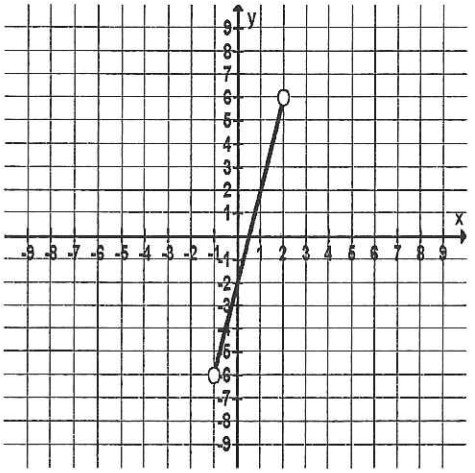
22. Give the range:



[-4, ∞)

a. $-\infty < y < \infty$ b. $y \ge -4$ c. $y > -4$

23. Give the range:



a. $-6 \le y \le 6$

b. $-1 < y < 2$

c. $-6 < y < 6$

(-6, 6)

24. Give the domain of the relation: {(2,3), (4,7), (6,9), (6, 12)}

a. {3,7,9,12} b. {2,4,6} c. {2,3,4,6,7,9,12}

25. Write equations for the following translations:

A. $f(x) = x^2$ translated right 3 units and down 4 units. $f(x) =$ $(x-3)^2 - 4$

B. $f(x) = (x-3)^2 + 1$ translated left 2 units and up 5 units. $f(x) =$ $(x+1)^2 + 6$

26. Determine the zeros of the quadratic function represented by the table below.

x	-4	-3	-1	3	4
f(x)	16	0	20	-12	0

(-3,0) + (4,0)

27. Use the table below to determine between which two values of x will the solution/x-intercept be found.

x	-2	-1	0	1	2
f(x)	2	-7	-14	-19	-22

-2 + -1

28. Use the table below to determine between which two values of x will the solution/x-intercept be found.

x	-4	-3	-2	-1	0
f(x)	-13	-2	5	8	7

-3 + -2

29. Arrange the following quadratic equations in order from narrowest to widest:

$y = x^2$ $y = 5x^2$ $y = \frac{1}{5}x^2$ $y = -7x^2$

$-7x^2$, $5x^2$, x^2, $\frac{1}{5}x^2$

30. List the following equations from narrowest to widest:

A. $y = -1/2x^2$ B. $y = 2/3x^2$ C. $y = -1/4x^2$ D. $y = 1/3x^2$

$\frac{2}{3}x^2$, $-\frac{1}{2}x^2$, $\frac{1}{3}x^2$, $-\frac{1}{4}x^2$

31. List the following equations from widest to narrowest:

A. $y = -2x^2$ B. $y = 3x^2$ C. $y = -6x^2$ D. $y = 4x^2$

$-2x^2$, $3x^2$, $4x^2$, $-6x^2$

32. Determine which transformations have been done to the parent function, $y = x^2$, to obtain the following quadratic functions (how has it been shifted and is it a **vertical stretch** or **vertical shrink** compared to the parent function):

A. $y = 3(x+2)^2 - 8$ vert stretch (narrower), left 2, down 8

B. $y = \frac{1}{2}(x-3)^2 + 5$ vert. shrink (wider), right 3, up 5

33. Completely factor the following quadratic expressions:

a. $x^2 + 17x + 60$

60
1 60
2 30
3 20
4 15
5 12

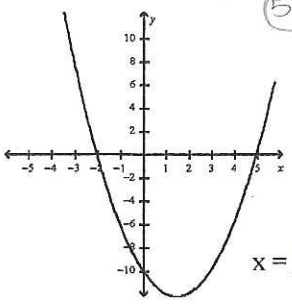
$(x+5)(x+12)$

b. $x^2 + 14x + 49$

$(x+7)(x+7) = (x+7)^2$

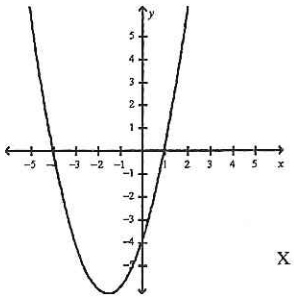
34. Determine the roots of the quadratic functions graphed below:

A.



x = -2 + 5

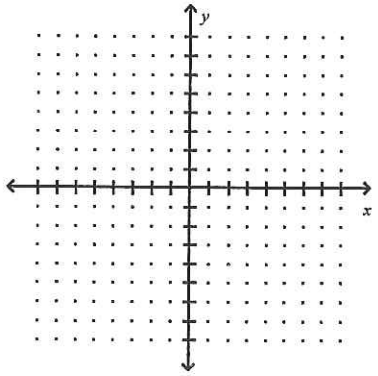
B.



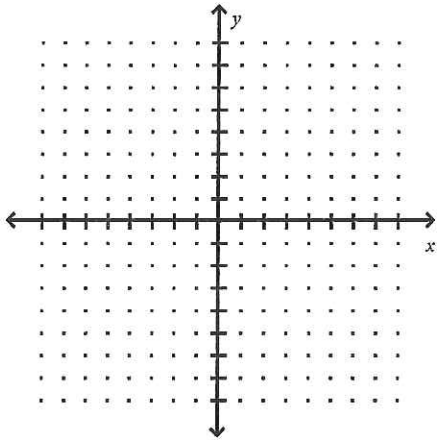
x = -4 + 1

35. Graph the quadratic inequalities:

A. $y < -2x^2 - 5x + 5$



B. $y > x^2 - 5x + 2$



36. Simplify completely.

a. $(3-4i)-(7-12i)$

$-4+8i$

b. $(3+3i)+(7-2i)$

$10+i$

c. $(3+3i)(7-2i)$

$21-6i+21i-6i^2$

$27+15i$

d. $(3-i)(4-7i)$

$12-21i-4i+7i^2$

$5-6i$

e. $(2x-3)^2(2x-3)$

$4x^2-6x-6x+9$

$4x^2-12x+9$

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

$9x^2+3x+3x+1$

$9x^2+6x+1$

37. Solve by factoring:

a. $x^2 - x - 42 = 0$

$(x-7)(x+6)=0$

$x-7=0 \quad x+6=0$

$x=7 \quad x=-6$

b. $2x^2 - 18 = 0$

$2(x^2-9)=0$

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

$x+3=0 \quad x-3=0$

$x=-3 \quad x=3$

38. Find the roots/zeros/solutions/x-intercepts of the following functions or equations:

A. $f(x) = x^2 + 5x - 6$

$0=(x+6)(x-1)$

$x=-6, \; x=1$

B. $f(x) = 3x^2 + 5x - 2$

$0=(3x-1)(x+2)$

$3x-1=0 \quad x+2=0$

$3x=1 \quad x=-2$

$x=\frac{1}{3}$

C. $(5x-2)\left(\frac{1}{2}x+1\right)=0$

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

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

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

Choose a quadratic equation with the given roots.

39. $x = -5$ and $x = 2$

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

$x^2-2x+5x-10$

$x^2+3x-10$

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

B. $x^2 + 7x + 10 = 0$

C. $x^2 - 3x + 10 = 0$

D. $x^2 + 3x - 10 = 0$

40. $x = -6$ and $x = -3$

$(x+6)(x+3)$

$x^2+3x+6x+18$

$x^2+9x+18$

A. $x^2 + 9x + 18 = 0$

B. $x^2 + 3x - 18 = 0$

C. $x^2 - 3x - 18 = 0$

D. $x^2 - 9x - 18 = 0$

41. The average hourly earnings of US production workers for 1990-1998 are shown in the table below.

	0	1	2	3	4	5	6	7	8
Year	1990	1991	1992	1993	1994	1995	1996	1997	1998
Avg Hourly Earnings	10.19	10.50	10.76	11.03	11.32	11.64	12.03	12.49	13.00

Using your graphing calculator, find the quadratic regression model for the data and write the quadratic equation. (HINT: Let x represent the # of years since 1990; round a, b & c to 3 decimal places).
Using the your equation, determine the projected hourly earnings for the year 2008.

$y = .017x^2 + .199x + 10.246$ $19.34

42. The table below shows the sales of "Doo-Dads" from 2000 and 2004.

Doo-Dad Sales	
Years since 2000	**Units (1000's)**
0	10.5
1	11.3
2	13.2
3	17.4
4	23.7

A. Find a quadratic model (quadratic regression) that best represents the sales growth of "Doo-Dads" since 2000.

$y = .95x^2 - .55x + 10.62$

B. Based on this model, estimate the sales of this product in the year 2010.

100.12 → 100,120

43. Simplify by putting the following into standard form.

a. $y = (x-4)(3x+1)$

$y = 3x^2 + x - 12x - 4$

$y = 3x^2 - 11x - 4$

b. $y = (2x-5)^2$

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

$y = 4x^2 - 10x - 10x + 25$

$y = 4x^2 - 20x + 25$

44. Change the following equations from standard form to Vertex Form. Give the vertex for each and the y-intercept.

$\left(\frac{-b}{2}\right)^2$ $(-3)^2 = 9$

a. $f(x) = x^2 - 6x + 11$

$y - 11 + 9 = x^2 - 6x + 9$

$y - 2 = (x-3)^2$

Vertex form $y = (x-3)^2 + 2$

Vertex $(3, 2)$ y-int. $(0, 11)$

$\left(\frac{10}{2}\right)^2$ $(5)^2 = 25$

b. $f(x) = x^2 + 10x + 3$

$y - 3 + 25 = x^2 + 10x + 25$

$y + 22 = (x+5)^2$

Vertex form $y = (x+5)^2 - 22$

Vertex $(-5, -22)$ y-int. $(0, 3)$

45. Match the corresponding letters a, c, h and k in the two quadratic equations with the correct description.

$$y=ax^2+bx+c \quad \text{and} \quad y=a(x-h)^2+k$$

(0, c) = the place the graph crosses the y-axis

(h, k) = the maximum or minimum height of the graph

a = how wide or narrow the graph is

h = how much it gets shifted or translated to the right or left

46. Match each equation to its table.

A.

x	−2	0	1	3
y	2	4	5	7

B.

x	−4	−1	2	3
y	5	−1	−7	−9

C.

x	−4	0	4	8
y	3	4	5	6

D.

x	0	2	3	6
y	−3	7	12	27

E.

x	−5	0	5	10
y	−4	−6	−8	−10

F.

x	−6	−4	0	6
y	−4	−3	−1	2

D $y=5x-3$ (−3, 0) B $y=-2x-3$ (−3, 0) C $y=\frac{1}{4}x+4$ (4, 0) E $y=-\frac{2}{5}x-6$ (−6, 0) F $y=\frac{1}{2}x-1$ (−1, 0) A $y=x+4$ (4, 0)