Name:_____ Date:_____

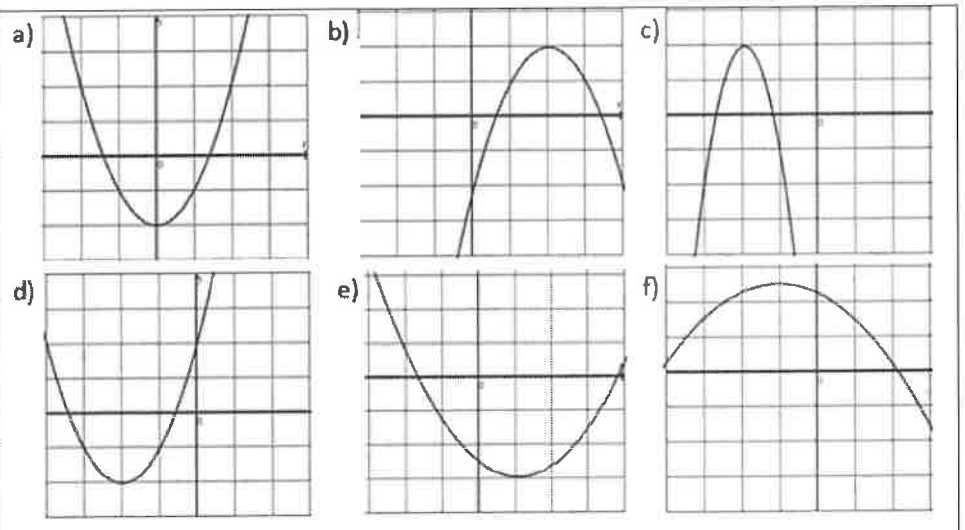
Pre-Calculus 11 Ch3/4 HW Lesson 6 Quadratic Functions in Standard Form $y=a(x-p)^2+q$

1. Indicate the values of "a", "p", "q" and the coordinates of the vertex in each equation:

a) $y=3(x-4)^2+8$ $a=$ $p=$ $q=$ *Vertex*:	b) $y=2(x+6)^2-13$ $a=$ $p=$ $q=$ *Vertex*:	c) $y=-4x^2+10$ $a=$ $p=$ $q=$ *Vertex*:
d) $y=21-(x-1)^2$ $a=$ $p=$ $q=$ *Vertex*:	e) $y=4(x-20)^2+11$ $a=$ $p=$ $q=$ *Vertex*:	f) $y=(-3x)^2+2$ $a=$ $p=$ $q=$ *Vertex*:
g) $y=-\frac{2}{3}(x-1)^2-2$ $a=$ $p=$ $q=$ *Vertex*:	h) $y=-3\left(x+\frac{2}{3}\right)^2-2$ $a=$ $p=$ $q=$ *Vertex*:	I) $y=(2x-1)^2-3$ $a=$ $p=$ $q=$ *Vertex*:

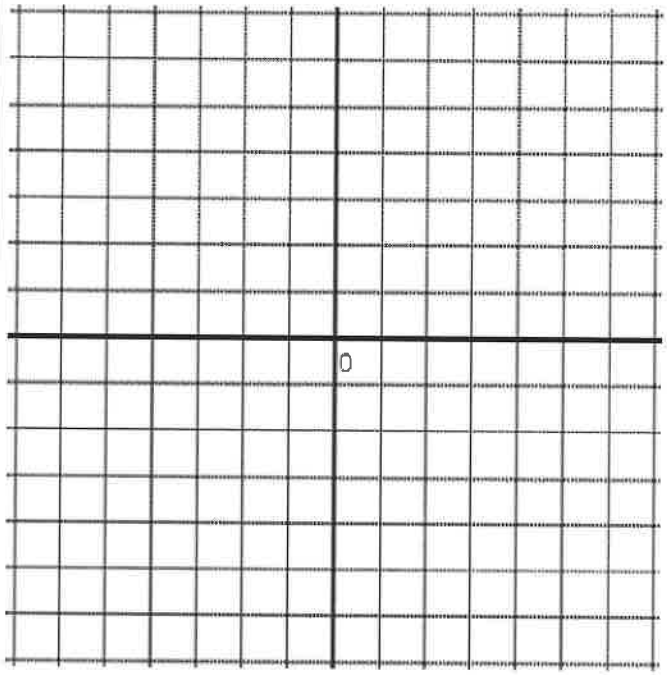
2. If each parabola is in the form of $y=a(x-p)^2+q$, then which graph best describes each equation:

i) $a<-1, p<0, q>0$	
ii) $0<a<1, p>0, q<0$	
iii) $a>0, p=0, q<0$	
iv) $0>a>-1, p<0, q>0$	

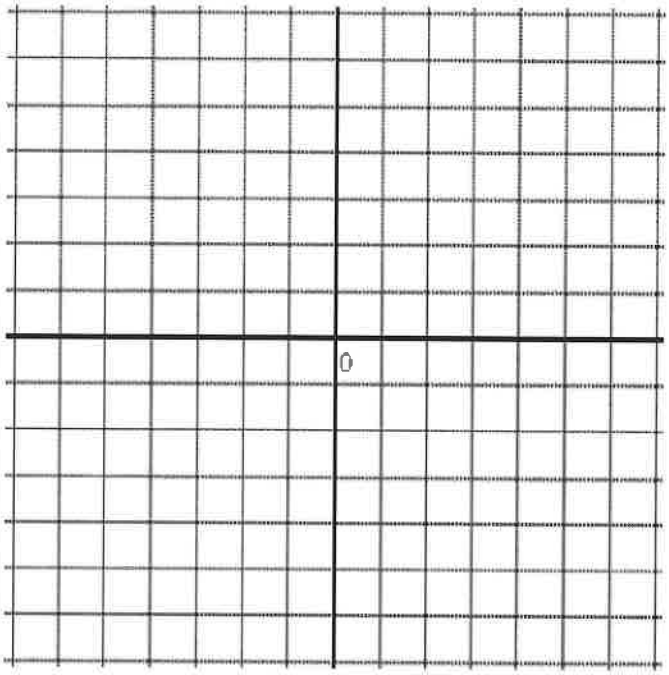


3. Graph each of the following quadratic functions and label the following: Equation of the Axis of Symmetry, Coordinates of the Vertex, and location of the X and Y-intercepts. Do **NOT** use a graphing calculator:

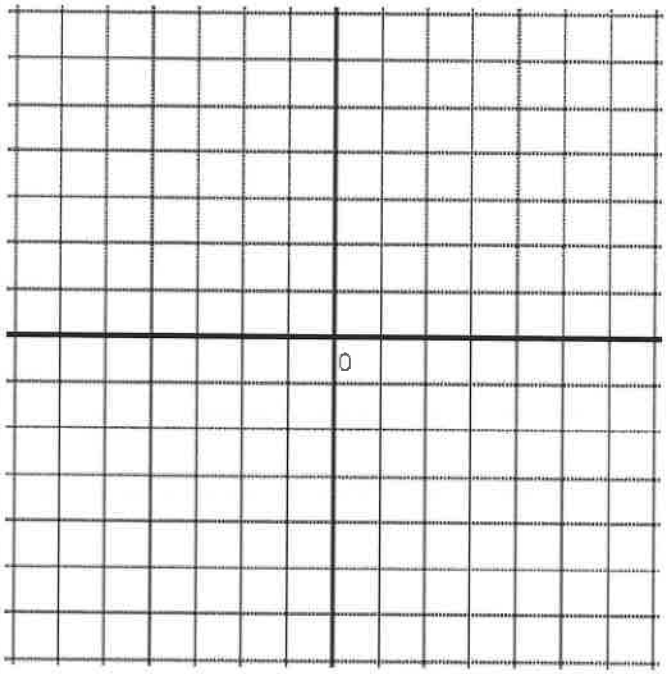
a) Equation: $y=(x-4)^2-5$



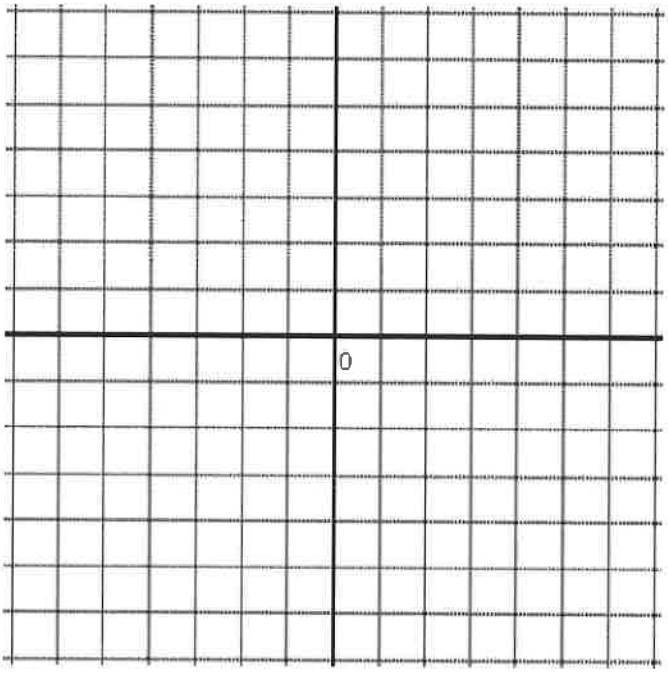
b) Equation: $y=-(x+3)^2+6$



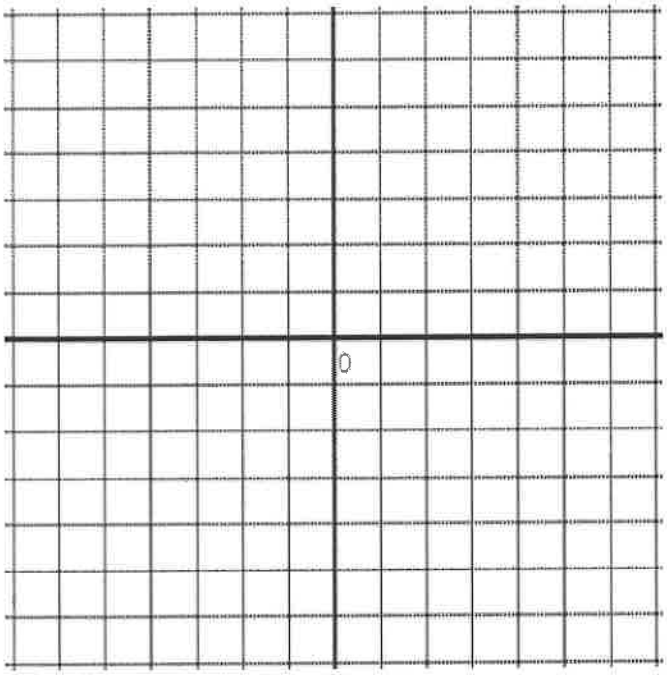
c) Equation: $y=\frac{1}{3}(x+3)^2+1$



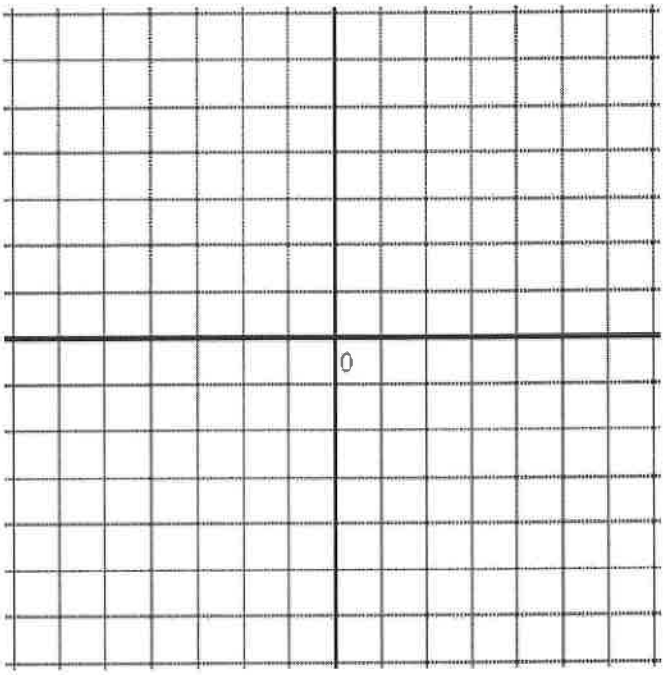
d) Equation: $y=-\frac{1}{2}(x-2)^2+7$



e) Equation: $y = 3(x-2)^2 - 5$



f) Equation: $y = -0.25(2x-6)^2 + 3$ (challenge)



4. What does it mean when two parabola functions are congruent?

5. How can the constant "a" in the equation $y = a(x-p)^2 + q$ determine the shape of a parabola? Explain:

6. If a parabola has a maximum value, then which way does the graph open? UP or DOWN? Explain?

7. Given the parabola: $y = -2(x-3)^2 + 4$, what is the AXIS of Symmetry?

8. The parabola $y = x^2$ is shifted 4 units to the right, 3 units down, and then flipped upside down over its vertex. What is the equation of the parabola now in APQ form?

9. The parabola $y = x^2 - 2x + 4$ is moved *'p"* units to the right and *"q"* units down. The x-intercepts of the resulting parabola are 3 and 5. What are the values of "*p*" and "*q*"?

10. Given the parabola, what is the vertex and axis of symmetry? $y = 4x^2 + 4x + 9$

11. If the quadratic equation $(x-2)^2 + k = 0$ has two distinct real roots, then what is the range of "k"? (Multiple choice, circle one) Justify your answer.

    a) $k > 2$ b) $k < 0$ c) $k \leq 0$ d) $k \leq 4$

12. Point "A" is the vertex of the parabola $y = x^2 + 2$, point "B" is the vertex of the parabola $y = (x-3)^2 + 2$, and "O" is the origin. Determine the area of $\triangle AOB$.

13. Given the parabola: $y = 3(x-4)^2 - q$ with $1 < q < 50$. If both x-intercepts are positive integers, then what are the possible values of "q"?

Name:_____ Date:_____

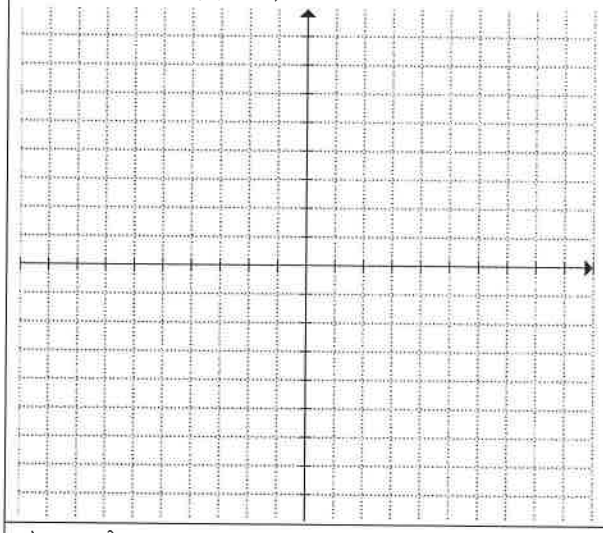
PC11 Ch3/4 HW Lesson 3 Graphing Quadratic Functions by factoring $y = ax^2 + bx + c$

1. For each of the following quadratic functions find the coefficients *"a,b,c"* and then find i) the Coordinates of the Vertex and the iii) Domain and Range

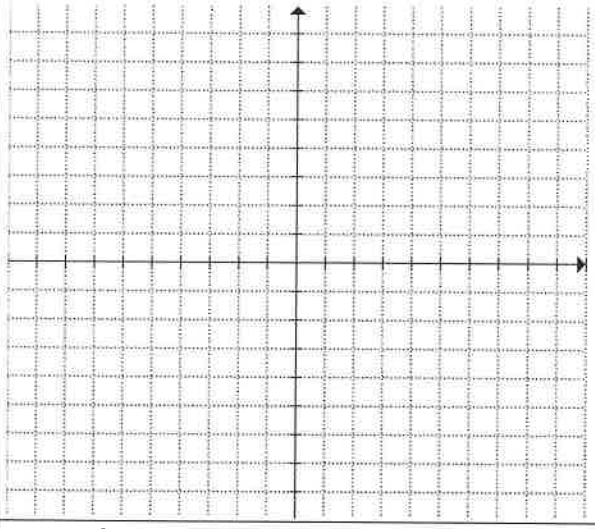
a) $y = x^2 + 3x - 18$ $a =$ $b =$ $c =$ X-intercepts: Axis of Symmetry: *Vertex* : Y-intercept:	b) $y = (2x-1)(x+3)$ $a =$ $b =$ $c =$ X-intercepts: Axis of Symmetry: *Vertex* : Y-intercept:
c) $y = x^2 - 12x + 35$ $a =$ $b =$ $c =$ X-intercepts: Axis of Symmetry: *Vertex* : Y-intercept:	d) $y = 6x^2 + 13x - 5$ $a =$ $b =$ $c =$ X-intercepts: Axis of Symmetry: *Vertex* : Y-intercept:
e) $y = 2x(x-4)$ $a =$ $b =$ $c =$ X-intercepts: Axis of Symmetry: *Vertex* : Y-intercept:	f) $y = 6x^2 + 5x - 4$ $a =$ $b =$ $c =$ X-intercepts: Axis of Symmetry: *Vertex* : Y-intercept:

2. Graph each of the following quadratic functions by finding the vertex, x-intercepts, and y-intercept. Label the vertex and axis of symmetry on your graph.

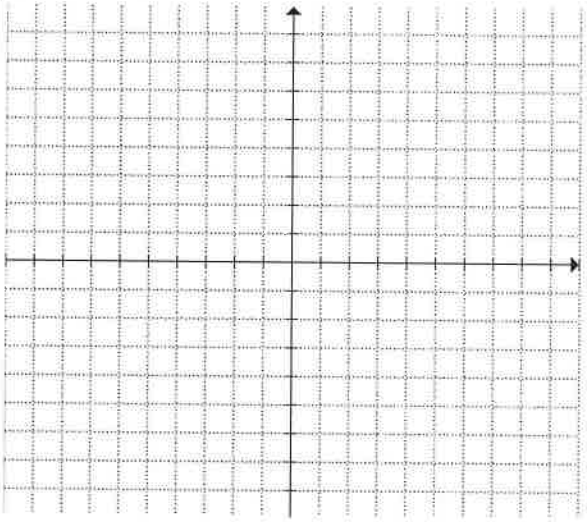
a) $f(x)=(x-4)(x+1)$



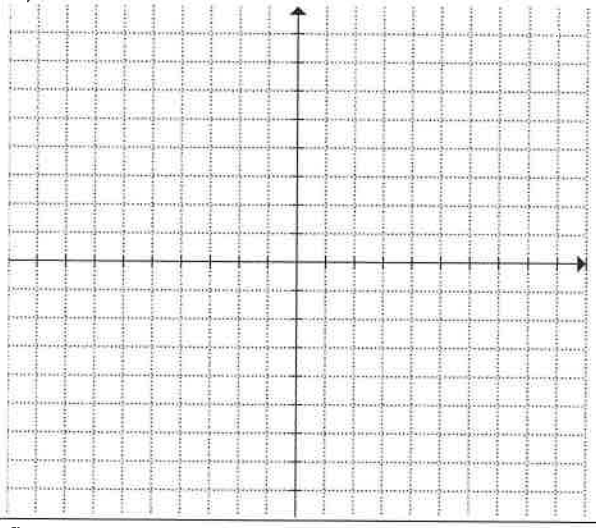
b) $y=2x(2x-5)$



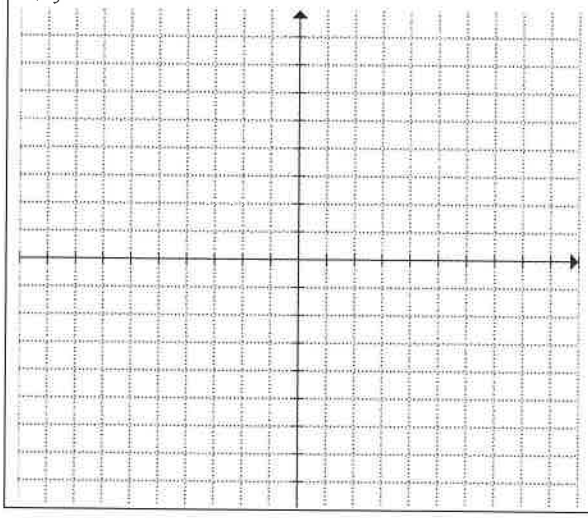
c) $y=x^2+2x-8$



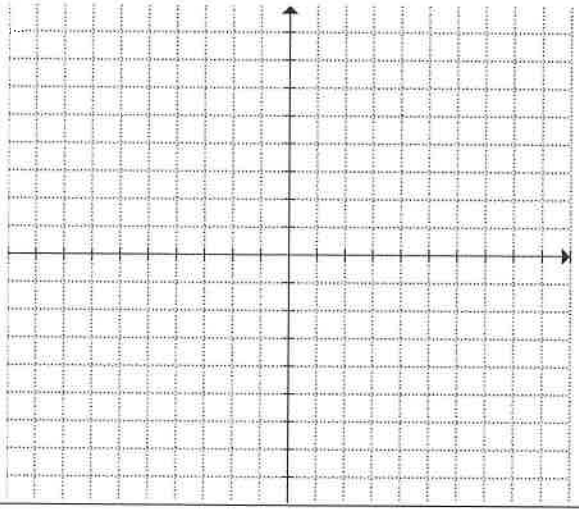
d) $y=x^2+7x+10$



e) $y=6x^2-x-12$



f) $y=3x^2+18x+25$



3. A pebble is thrown from a bridge into a river at height "h" meters above the river. Let "t" be the number of seconds after the release. If the height of the pebble is given by the equation: $h(t) = -4.9t^2 + 10t + 65$, then:

   a) How high is the pebble after 3 seconds?

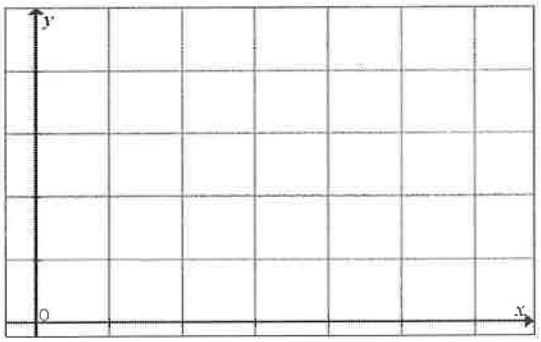
   b) What is the vertex of the equation? What does the vertex represent?

   c) What is the domain and range of this scenario and what does it represent?

   d) What is the y-intercept and what does it represent?

4. Tom throws a football from the top of his building. The height of the ball is given by the formula: $h(t) = -3t^2 + 60t + 132$, where "h" is the height of the football and "t" is the number of seconds after the throw.

a) Draw a graph for this scenario and then find the vertex of this equation? Show your work algebraically



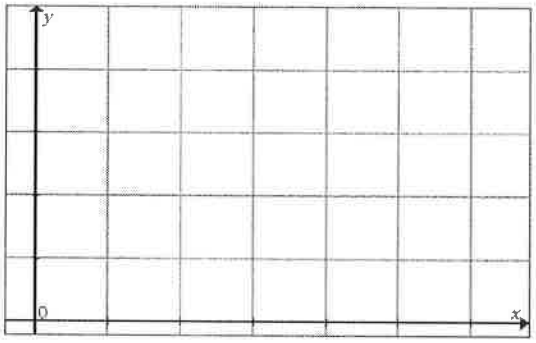
b) What is the domain and range of this scenario? Explain it in the context of this question:

c) When will the ball be falling to 150m?

5. A pebble is dropped from a bridge into a river at height "h" meters above. Let "t" be the number of seconds after the release. If $h(t) = 65 - 4.9t^2$, then how high is the pebble after 3 seconds? What is the domain and range of this scenario? When will the pebble hit the ground?

6. Suppose you have 100 m of fencing that will be used to build a rectangular fence around your house
   a) Write a quadratic function in standard form to represent the area of the rectangular lot

   b) What are the coordinates of the vertex? What does the coordinate represent?
   c) Sketch the graph of the function



7. Determine the domain and range: Determine the vertex of the parabola $y=3(x-20)(x+22)$

8. A tennis ball is dropped from a balcony. The height of the ball (h) above the ground is given by the formula $h(t)=78.4-4.9t^2$. Where "t" is the number of seconds after release. How high is the balcony from the ground? When will the ball hit the ground?

9. Tom throws a football from the top of his building. The height of the ball is given by the formula: $h(t)=-12t^2+7t+85$, where "h" is the height of the football and "t" is the number of seconds after the throw. What is the domain and range of this scenario? When will the ball be falling to 36m?

Name:_____ Date:_____

Pre Calculus 11 Ch3/4 HW: Lesson 7 Completing the Square

1. What is a perfect trinomial? Explain using your own words? How do you tell if a trinomial is a perfect trinomial?

2. Which of the following are perfect trinomials? Indicate YES or NO I(If not, explain why If yes, factor it.

a) $y = x^2 + 12x + 36$	b) $y = x^2 + 10x - 25$	c) $y = x^2 - 14x + 49$
d) $y = x^2 - 20x - 100$	e) $y = x^2 + 22x + 121$	f) $y = x^2 - 40x + 400$
g) $y = 4x^2 - 4x + 1$	h) $y = 4x^2 - 9$	i) $y = 25x^2 - 20x + 4$

3. What does it mean to complete the square? Explain:

4. Indicate what value should be added to the trinomial so that the equation could be a perfect trinomial:

a) $x^2 + (?) + 9$	b) $x^2 + 8x + (?)$
c) $(?) - 2x + 1$	d) $x^2 - (?) + 81$
e) $x^2 - 15x + (?)$	f) $x^2 + 17x + (?)$
g) $4x^2 + 4x + (?)$	h) $9x^2 - (?) + 1$

5. What are the first two steps in the process of completing the square?

6. What is $12 \div \left(-\frac{1}{2}\right)$? What happens when you divide a value by a fraction?

7. Convert each equation in to vertex form: $y = a(x-p)^2 + q$ by completing the square. Show all your steps:

a) $y = x^2 + 4x - 20$ *Equation*:	b) $y = x^2 - 8x - 20$ *Equation*:
c) $y = -x^2 - 14x - 15$ *Equation*:	d) $y = 4x^2 + 20x - 12$ *Equation*:

e) $y=2x(x-5)$ *Equation*:	f) $y=3x^2+6x+10$ *Equation*:
g) $y=-2x^2-15x+100$ *Equation*:	h) $y=-3x^2+18x+50$ *Equation*:
e) $y=-\frac{1}{2}x^2+14x+100$ *Equation*:	f) $y=\frac{1}{2}x^2+8x-30$ *Equation*:

8. Given a quadratic function in the form of $y = a(x-p)^2 + q$:

   a. If $a > 0$ and $q > 0$, then the function will not have any roots: TRUE or FALLSE (Explain)

   b. If $a < 0$ and $q > 0$, then the function will have only one root: TRUE or FALLSE (Explain)

   c. If $a < 0$ and $p < 0$, then the function will at least one root: TRUE or FALLSE (Explain)

   d. If $a \times q < 0$ then the function will have two roots: TRUE or FALLSE (Explain)

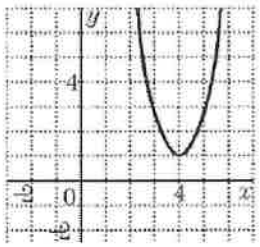
9. 3 tried to convert a quadratic function from general form to vertex form by completing the square. Review each step and indicate if there are any errors in the process:

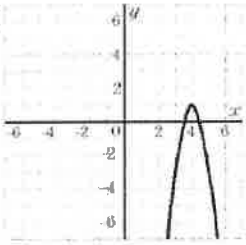
a) student #1 *step* 1: $y = 3x^2 - 6x + 10$ *step* 2: $y = (3x^2 - 6x) + 10$ *step* 3: $y = 3x(x-2) + 10$ *step* 4: $y = 3(x-2)^2 + 10$	b) Student #2 *Stept* 1: $y = -2x^2 + 20x - 3$ *Stept* 2: $y = (-2x^2 + 20x) - 3$ *Stept* 3: $y = -2(x^2 + 10x) - 3$ *Stept* 4: $y = -2(x^2 + 10x + 25 - 25) - 3$ *Stept* 5: $y = -2(x+5)^2 + 50 - 3$ *Stept* 6: $y = -2(x+5)^2 + 47$
c) Student #3 *Stept* 1: $y = -\frac{1}{2}x^2 + 4x + 5$ *Stept* 2: $y = \left(-\frac{1}{2}x^2 + 4x\right) + 5$ *Stept* 3: $y = -\frac{1}{2}(x^2 - 2x) + 5$ *Stept* 4: $y = -\frac{1}{2}(x^2 - 2x + 1 - 1) + 5$ *Stept* 5: $y = -\frac{1}{2}(x-1)^2 + 1 + 5$ *Stept* 6: $y = -\frac{1}{2}(x-1)^2 + 6$	d) Student #4 *Stept* 1: $y = \frac{2}{3}x^2 + 8x + 10$ *Stept* 2: $y = \left(\frac{2}{3}x^2 + 8x\right) + 10$ *Stept* 3: $y = \frac{2}{3}(x^2 + 12x) + 10$ *Stept* 4: $y = \frac{2}{3}(x^2 + 12x + 36 - 36) + 10$ *Stept* 5: $y = \frac{2}{3}(x+6)^2 + 24 + 10$ *Stept* 6: $y = \frac{2}{3}(x+6)^2 + 34$

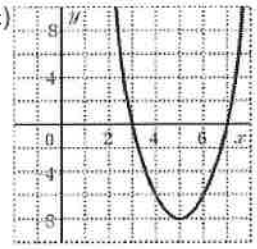
Name:_____ Date:_____

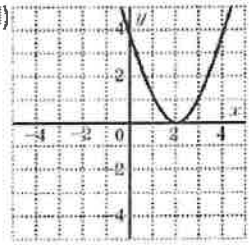
Pre Calculus 11: Ch3/4 HW Lesson 4 Domain, Range, and Using your Ti-83

1. Indicate the number of roots for each of the following quadratic functions:

a) 

b) 

c) 

d) 

2. Define the *"domain of a function"* using your own words:

3. What is the difference between domain and range?

4. How do you know that the domain or range of a function will be "all real numbers" $[x \in \mathbb{R}]$? Explain:

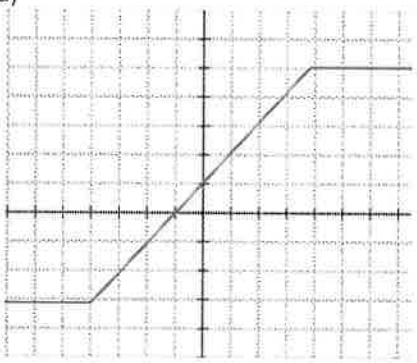
5. What is the domain and range of a linear function?

6. What is the domain of a quadratic function?

7. How do you find the range of a quadratic function? Explain:

8. Given each of the following graphs, indicate the domain and range:

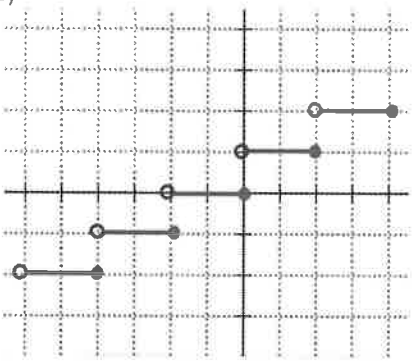
a)



Domain:

Range:

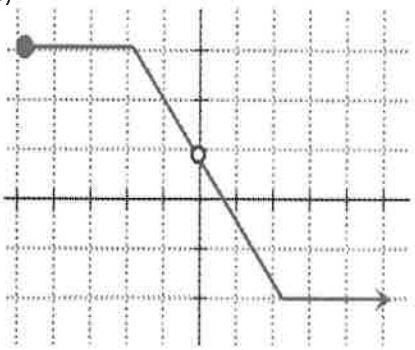
b)



Domain:

Range:

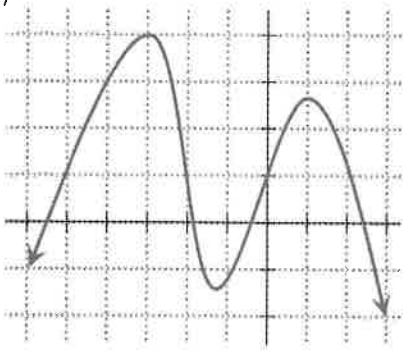
c)



Domain:

Range:

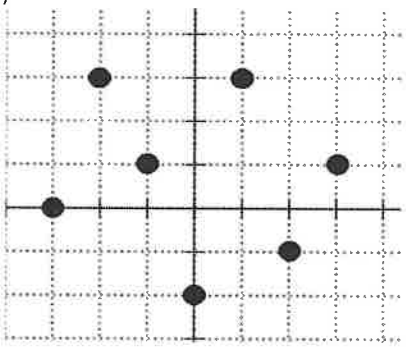
d)



Domain:

Range:

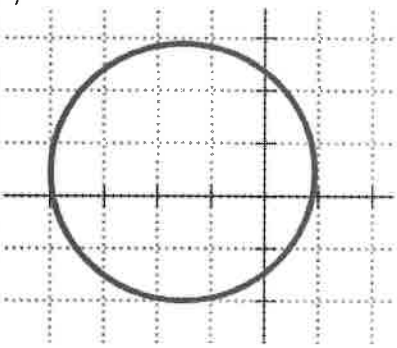
e)



Domain:

Range:

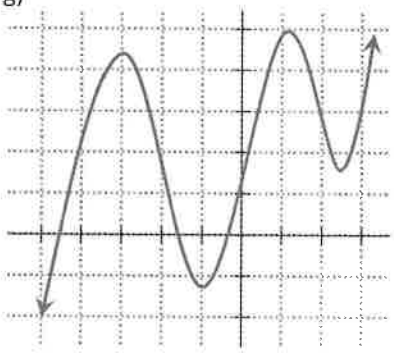
f)



Domain:

Range:

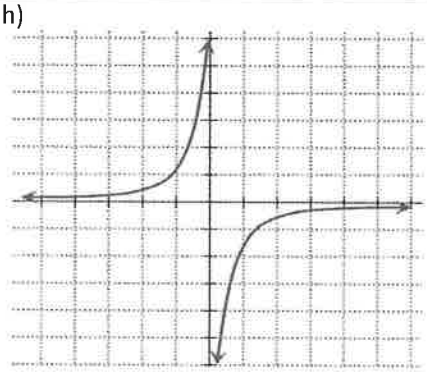
g)



Domain:

Range:

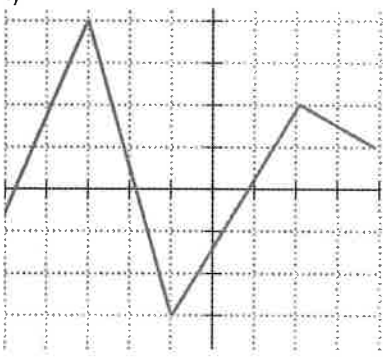
h)



Domain:

Range:

i)

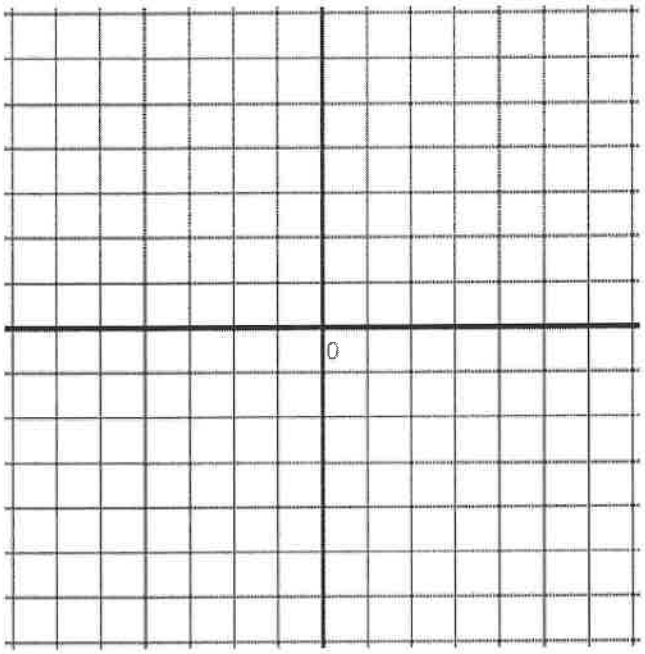


Domain:

Range:

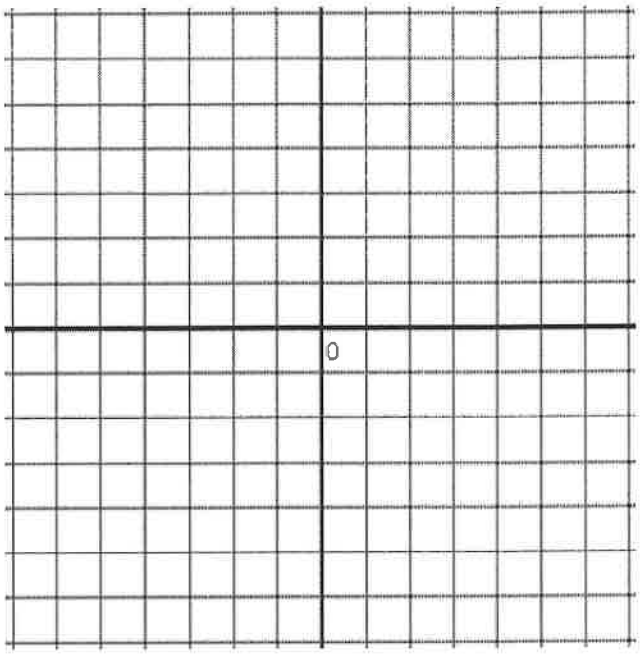
9. Given each function, graph it on your calculator, graph it on the grid provided, and find the following:

a) Equation: $y = 2x - 5$



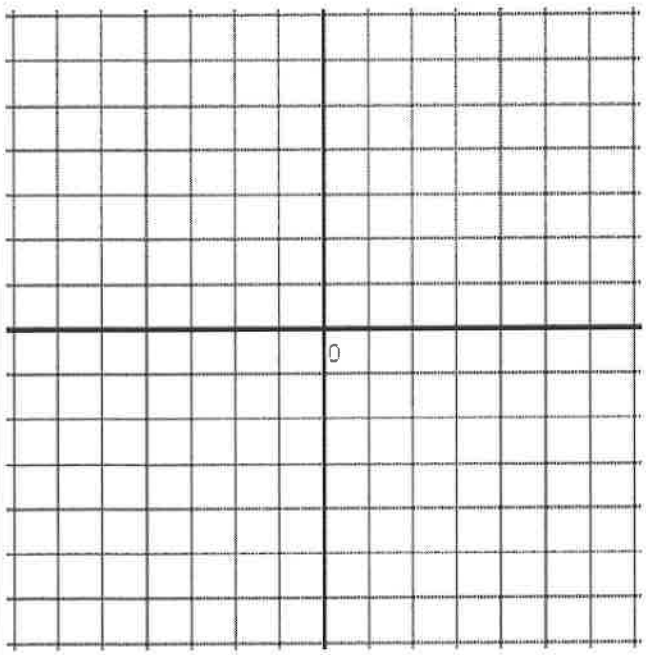
Y-Intercept:_____ X-intercept:_____

b) Equation: $y = x^2 - 8$



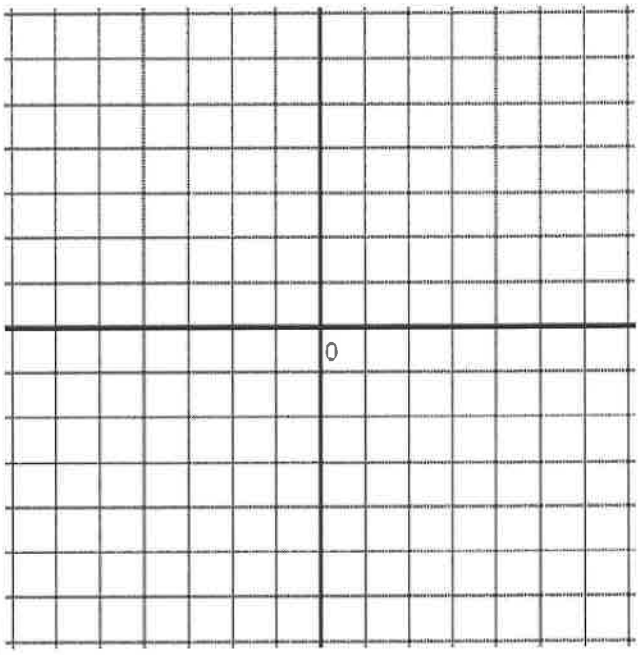
Y-Intercept:_____ X-intercept:_____

c) Equation: $y = 2x^2 - 3x - 10$



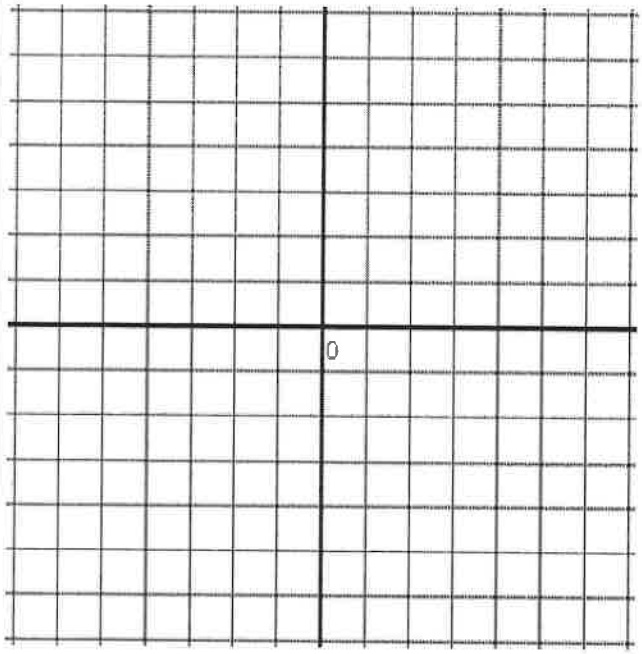
Vertex:_____ Xintercept:_____

d) Equation: $y = -3x^2 + 8x + 12$



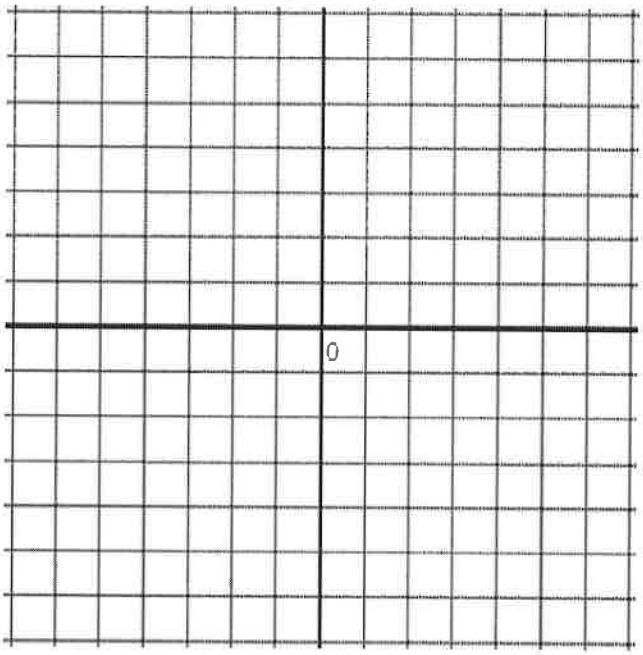
Vertex:_____ X-intercept:_____

e) Equation: $y = -0.5x^2 + 8x + 20$



Vertex:_____ Range:_____

f) Equation: $y = \frac{1}{2}(x-4)(x+5)$



Vertex:_____ Range:_____

10. The roots of a quadratic equation are 5 and 1.25. Find the equation:

11. The height of a football (h) tossed by a quarterback is given by the equation $h = -4.9t^2 + 19t + 1.4$, where "t" is the numbers of seconds after the ball is tossed. Find out how long it will take for the ball to hit the ground.

    b) What is the domain and range of this function?

12. 24 meters of fencing are used to enclose a rectangular garden.
    i) Write an equation for the area (A) of the garden as a function of the length of one side.

    ii) Then find the length of one side if the area of the garden is 30m

    iii)What is the domain and range of this scenario?