Name:________________________ Date:________________________

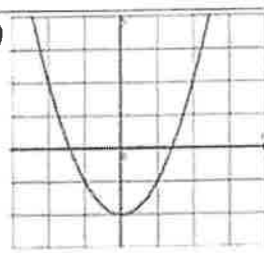
Pre-Calculus 11 Ch3/4 HW Lesson 6 Quadratic Functions in Standard Form $y=a(x-p)^2+q$

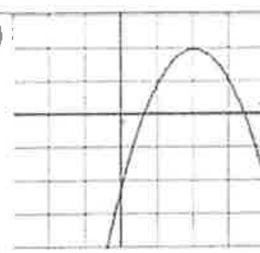
1. Indicate the values of "a", "p", "q" and the coordinates of the vertex in each equation:

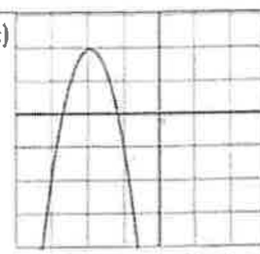
a) $y=3(x-4)^2+8$ $a=$ 3 $p=$ +4 $q=$ 8 $Vertex:$ (4, 8)	b) $y=2(x+6)^2-13$ $a=$ 2 $p=$ -6 $q=$ 13 $Vertex:$ (-6, -13)	c) $y=-4x^2+10$ $a=$ -4 $p=$ 0 $q=$ 10 $Vertex:$ (0, 10)
d) $y=21-(x-1)^2$ $a=$ -1 $p=$ 1 $q=$ 21 $Vertex:$ (1, 21)	e) $y=4(x-20)^2+11$ $a=$ 4 $p=$ 20 $q=$ 11 $Vertex:$ (20, 11)	f) $y=(-3x)^2+2$ $a=$ -3 $p=$ 0 $q=$ 2 $Vertex:$ (0, 2)
g) $y=-\frac{2}{3}(x-1)^2-2$ $a=$ $-\frac{2}{3}$ $p=$ 1 $q=$ -2 $Vertex:$ (1, -2)	h) $y=-3\left(x+\frac{2}{3}\right)^2-2$ $a=$ -3 $p=$ $-\frac{2}{3}$ $q=$ -2 $Vertex:$ $(-2/3, -2)$	i) $y=(2x-1)^2-3$ GRAPH IT! $a=$ 2 $p=$ $\frac{1}{2}$ $q=$ -3 $Vertex:$ $(1/2, -3)$

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

i) $a<-1, p<0, q>0$ Opens down, compress Shift left, Shift up	c
ii) $0<a<1, p>0, q<0$ Expanded. Opens up Shift right. Shift d.	e
iii) $a>0, p=0, q<0$ Vertex at x = 0 opens up Shift d.	a
iv) $0>a>-1, p<0, q>0$ Expanded. Opens down. Shift left Shift up	f

a)


b)


c)


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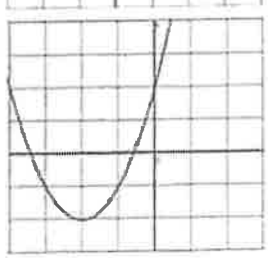
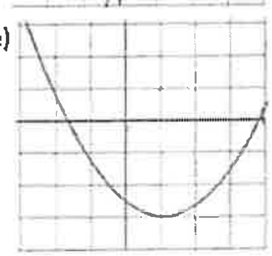
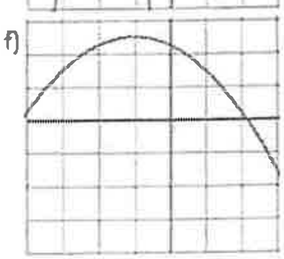
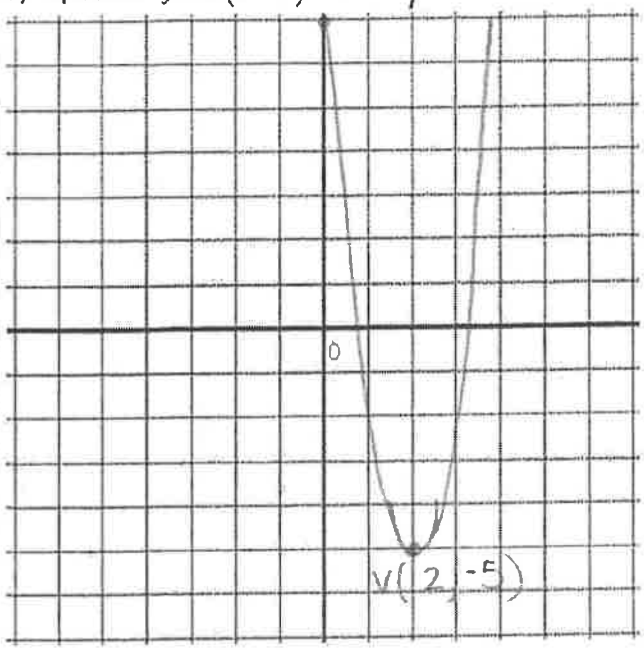


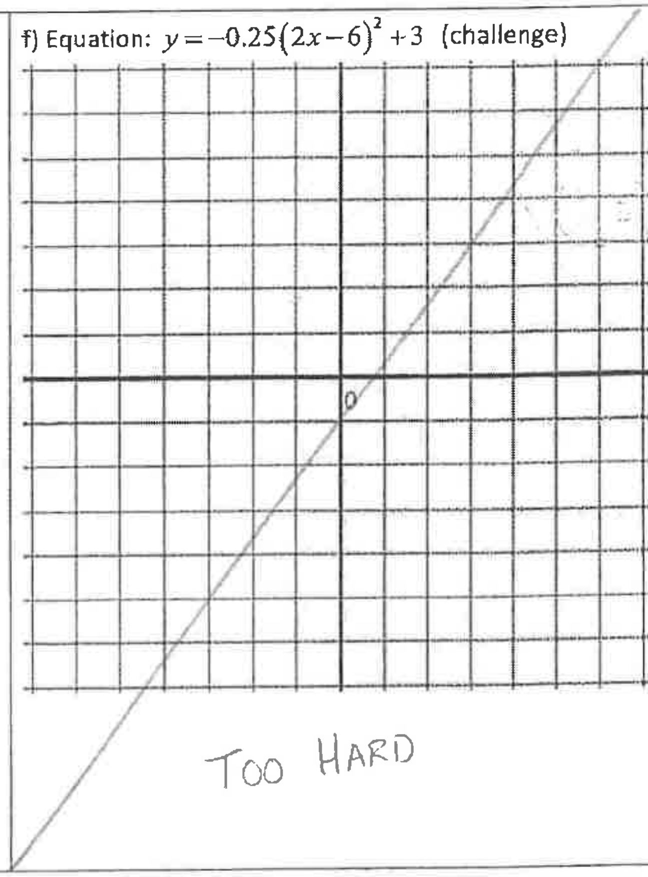
e)


f)


e) Equation: $y=3(x-2)^2-5$ y-int = 7



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



TOO HARD

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:

a determines whether parabola opens up or down, and whether it is compressed : $|a|>1$ or expanded $0<|a|<1$

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

DOWN

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

$x = p$

$x = 3$

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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) $y = x^2 + 3x - 18$

$a = 1$ $b = 3$ $c = -18$

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

A of S is average x-int

$\frac{3+(-6)}{2} = -\frac{3}{2}$

$p = -3/2$

$q = c - ap^2$

$q = -18 - (1)(-3/2) = -20.25$

X-intercepts: $3, -6$ Axis of Symmetry: $-\frac{3}{2}$

Vertex: $(-1.5, \cancel{-11.5}\ {-20.25})$ Y-intercept: -18

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

$a = 2$ $b = 5$ $c = -3$

$\cancel{\frac{\frac{1}{2} + 3}{2} = 1.75}$

$p = \frac{-b}{2a} = \frac{-5}{2(2)} = -1.25$

$q = c - ap^2$

$= -3 - (2)(-1.25)^2$

$= \cancel{-9.125}\ -6.12$

$\cancel{p = 1.75}$

X-intercepts: $\frac{1}{2}, -3$ Axis of Symmetry: $\cancel{1.75}\ -1.25$

Vertex: $-1.25, \cancel{-9.125}\ -6.12$ Y-intercept: -3

c) $y = x^2 - 12x + 35$

$a = 1$ $b = -12$ $c = 35$

$(x-7)(x-5)$

$\frac{5+7}{2} = 6$

$p = 6$

$q = c - ap^2$

$= 35 - 6^2$

$= -1$

X-intercepts: $5, 7$ Axis of Symmetry: 6

Vertex: $(6, -1)$ Y-intercept: 35

d) $y = 6x^2 + 13x - 5$

$a = 6$ $b = 13$ $c = -5$

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

$\frac{\left[\frac{1}{3} + \left(-\frac{5}{2}\right)\right]}{2} = -\frac{13}{12}$

$p = -13/12$

$q = c - ap^2$

$q = \frac{-289}{24}$

X-intercepts: $\frac{1}{3}, -\frac{5}{2}$ Axis of Symmetry: $-13/12$

Vertex: $(-13/12, -289/24)$ Y-intercept: -5

e) $y = 2x(x-4)$ $2x^2 - 4x + 0$

$a = 2$ $b = -4$ $c = 0$

$\frac{2x(x-4)}{(x-4)} = \frac{0}{(x-4)}$

$2x = 0$

$x = 0$

$q = c - ap^2$

$q = 0 - 2(2^2)$

$q = 8$

$\frac{0+4}{2} = 2$

AoS $= 2$

X-intercepts: $0, 4$ Axis of Symmetry: 2

Vertex: $(2, 8)$ Y-intercept: 0

(p, q)

f) $y = 6x^2 + 5x - 4$

$a = 6$ $b = 5$ $c = -4$

$(2x-1)(3x+4)$

I guess and tested til a combo worked!

$\frac{\frac{1}{2} - \frac{4}{3}}{2} = \frac{\frac{3}{6} - \frac{8}{6}}{2}$

$-\frac{5}{6} \times \frac{1}{2} = -\frac{5}{12}$

$q = c - ap^2$

$q = -4 - 6(-5/12) = -18/12$

X-intercepts: $\frac{1}{2}, -\frac{4}{3}$ Axis of Symmetry: $-\frac{5}{12}$

Vertex: $\left(-\frac{5}{12}, \frac{-18}{12}\right)$ Y-intercept: -4

(2)

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

$\boxed{x\text{-int} = -1, 4}$

y-int @ $x=0$

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

$\boxed{y\text{-int} = -4}$

Axis of Symmetry = Avg of x-int

$A \text{ of } S = \frac{-1+4}{2} = \frac{3}{2}$

$\boxed{A \text{ o } S = \frac{3}{2}}$

$V(p, q)$

$\boxed{\text{Vertex} = (3/2, -25/4)}$

$p = A \text{ of } S$

$\boxed{p = \frac{3}{2}}$

Use this equation to find (x, y) coord. Choose values for x and find resulting f(x) (a.k.a. y) values

$q = c - ap^2$

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

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

$\boxed{f(x) = x^2 - 3x - 4}$

$q = -4 - 1\left(\frac{3}{2}\right)^2$

$q = -4 - \frac{9}{4}$

$\boxed{q = \frac{-25}{4}} = -6.25$

x	y
-2	6
-1	0
-0	-4
1	-6
2	-6

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

$\boxed{x\text{-int} = 0, \frac{5}{2}}$

@ $y = 0$

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

$2x = 0$

$x = \frac{0}{2}$

$x = 0$

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

$2x - 5 = 0$

$2x = 5$

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

y-int @ $x = 0$

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

$y = 0(0-5)$

$\boxed{y\text{-int} = 0}$

Vertex = (p, q)

$\boxed{\text{Vertex} = (5/4, -6.25)}$

Axis of Symmetry = Avg of x-int

$AoS = \frac{0 + \frac{5}{2}}{2} = \frac{5}{2} \times \frac{1}{2} = \frac{5}{4}$

$\boxed{A\text{ of }S = \frac{5}{4}}$

$p = AoS$

$\boxed{p = \frac{5}{4}}$

$q = c - ap^2$

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

$\boxed{y = 4x^2 - 10x + 0}$

$q = 0 - 4\left(\frac{5}{4}\right)^2$

$q = -4\left(\frac{25}{16}\right)$

$q = \frac{-100}{16} = -6.25$

$\boxed{q = -6.25}$

Use this to find x, y coord.

x	y
-2	36
-1	14
0	0
1	-6
2	-4
3	6

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

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

x-int @ $y=0$

$\boxed{\text{x-int} = 2, -4}$

y-int @ $x = 0$

$y = (0+4)(0-2)$

$\boxed{\text{y-int} = -8}$

A of S = Avg x-int

A of S = $\frac{2-4}{2} = -1$

$\boxed{\text{A of S} = -1}$

p = A of S

$\boxed{p = -1}$

$q = c - ap^2$

$q = -8 - (1)(-1)^2$

$\boxed{q = -9}$

$\boxed{V(-1, -9)}$

x	y
-3	-5
-2	-8
-1	-9
0	-8
1	-5
2	0
3	7

These are all coordinates of the parabola

(-3, -5), (-2, -8), (-1, -9)...

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?

$h(3) = -4.9(3)^2 + 10(3) + 65$

$h(3) = 50.9$ m

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

$p = \frac{-B}{2A} = \frac{-10}{2(-4.9)} = 1.02$ s $q = c - ap^2 = 65 - (-4.9)(1.02^2)$ $q = 70.1$ m

Max height of 70.1 m @ t = 1.02 s

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

D: $t \geq 0$ (can't have negative time)

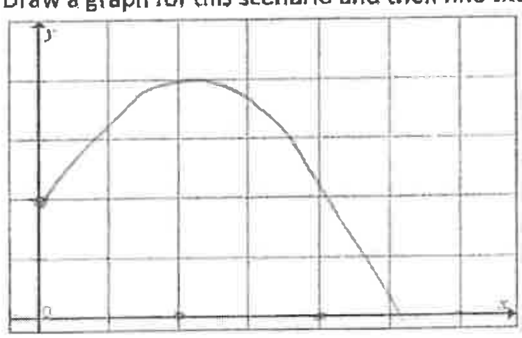
R: $0 \leq h \leq 70.1$

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

y-int @ t = 0 y-int = 65 m Starting height

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. y-int = 132 $p = -\frac{60}{2(-3)} = 10$ s

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



$h(1) = -3(1)^2 + 60(1) + 132 = 189$

$h(2) = 240$ $h(11) = 429$ $h(20) = 132$

$h(3) = 285$ $h(10) = 432$

$h(4) = 324$ $h(9) = 429$ $V(10, 432)$

$h(5) = 357$ $h(8) = 420$

$h(6) = 384$ $h(7) = 405$

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

D: $t \geq 0$

R: $0 \leq h \leq 432$

$3t^2 - 60t = 18$

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

$150 = -3t^2 + 60t + 132 \rightarrow 3t^2 - 60t + 18 = 0$

$18 = -3t^2 + 60t$ Solve for t

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?

(5) $h(t) = 65 - 4.9t^2$

$h(3) = 65 - 4.9(3)$

$= 65 - 14.7$

$\boxed{h(3) = 50.3 \text{ m}}$

Domain and Range

Domain is time $t \not< 0$

$\therefore \boxed{D = t \geq 0,\ t \in \mathbb{R}}$

Range must know Vertex

$p = \frac{-B}{2A} = \frac{-0}{2(-4.9)} = 0$

$\boxed{p = 0}$

$q = c - ap^2$

$q = c$

$\boxed{q = 65}$

$\boxed{V(0, 65)}$

$R = h(t) \leq 65$
$h(t) \geq 0$

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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) $y = x^2 + 12x + 36$ $(x+6)^2$ ✓	b) $y = x^2 + 10x - 25$ ✗	c) $y = x^2 - 14x + 49$ $(x-7)^2$ ✓
d) $y = x^2 - 20x - 100$ ✗	e) $y = x^2 + 22x + 121$ $(x+11)^2$ ✓	f) $y = x^2 - 40x + 400$ $(x-20)^2$ ✓
g) $y = 4x^2 - 4x + 1$ $(2x-1)^2$ ✓	h) $y = 4x^2 - 9$ $(2x+3)(2x-3)$ ✗	i) $y = 25x^2 - 20x + 4$ $(5x-2)^2$ ✓

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) $x^2 + (?) + 9$ $x^2 + 6x + 9$	b) $x^2 + 8x + (?)$ $x^2 + 8x + 16$
c) $(?) - 2x + 1$ $x^2 - 2x + 1$	d) $x^2 - (?) + 81$ $x^2 - 18x + 81$
e) $x^2 - 15x + (?)$ $x^2 - 15x + 56$	f) $x^2 + 17x + (?)$ $x^2 + 17x + 72$
g) $4x^2 + 4x + (?)$ $4x^2 + 4x + 1$	h) $9x^2 - (?) + 1$ $9x^2 - 6x + 1$

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

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

$y = 2(x^2 - 5x \qquad) + 0$

$y = 2(x^2 - 5x + 6.25 - 6.25)$

$y = 2[(x + 2.5)^2 - 6.25]$

$\boxed{y = 2(x+2.5)^2 - 12.5}$

Equation :

f) $y=3x^2+6x+10$

$y = 3[x^2 + 2x \qquad] + 10$

$y = 3[x^2 + 2x + 1 - 1] + 10$

$y = 3[(x+1)^2 - 1] + 10$

$y = 3(x+1)^2 - 3 + 10$

$\boxed{y = 3(x+1)^2 + 7}$

Equation :

g) $y=-2x^2-15x+100$

$y = -2[x^2 - 7.5x - 50] + 100$

$y = -2[(x - 3.75)^2$

Equation :

h) $y=-3x^2+18x+50$

$y = -3(x^2 - 6x + 9 - 9) + 50$

$y = -3[(x-3)^2 - 9] + 50$

$y = -3(x-3)^2 + 27 + 50$

$\boxed{y = -3(x-3)^2 + 77}$

Equation :

e) $y=-\frac{1}{2}x^2+14x+100$

$y = -\frac{1}{2}[x^2 - 28x \qquad] + 100$

$y = -\frac{1}{2}[x^2 - 28x + 196 - 196] + 100$

$y = -\frac{1}{2}[(x-14)^2 - 196] + 100$

$y = -\frac{1}{2}(x-14)^2 + 98 + 100$

Equation : $\boxed{y = -\frac{1}{2}(x-14)^2 + 198}$

f) $y=\frac{1}{2}x^2+8x-30$

$y = \frac{1}{2}[x^2 + 16x \qquad] - 30$

$y = \frac{1}{2}[x^2 + 16x + 64 - 64] - 30$

$y = \frac{1}{2}[(x+8)^2 - 64] - 30$

$y = \frac{1}{2}(x+8)^2 - 32 - 30$

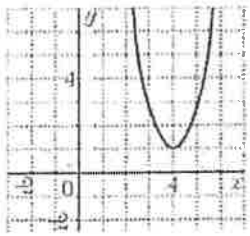
$\boxed{y = \frac{1}{2}(x+8)^2 - 62}$

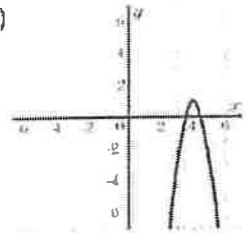
Equation :

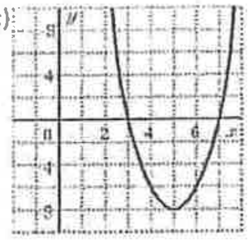
Name:______________ Date:________________

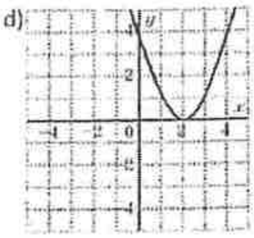
Pre Calculus 11: Ch3/4 HW Lesson 4 Domain, Range, and Using your Ti-83

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?

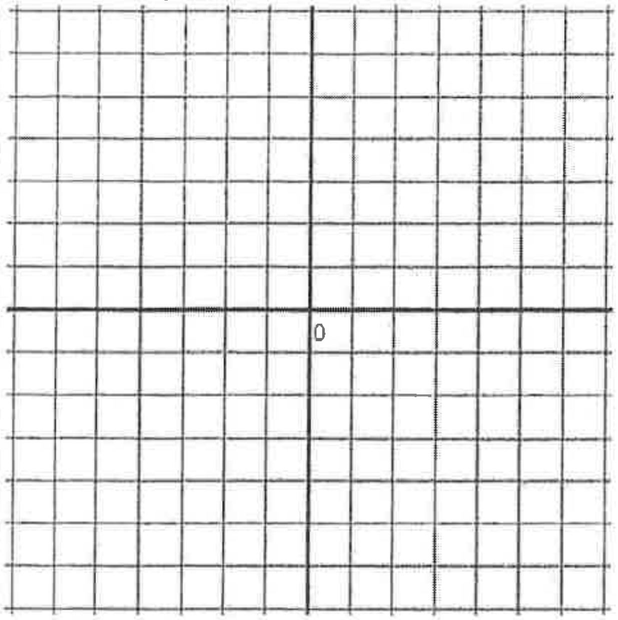
4. How do you know that the domain or range of a function will be "all real numbers" $[x \in \mathbb{R}]$? Explain:

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

6. What is the domain of a quadratic function?

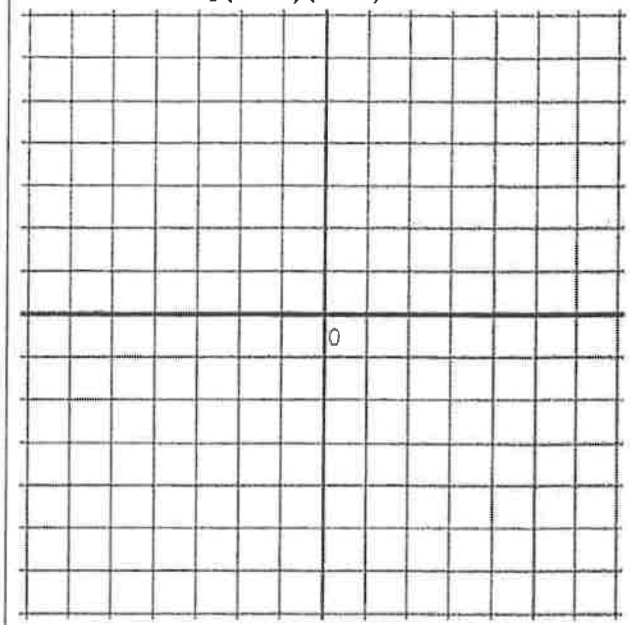
7. How do you find the range of a quadratic function? Explain:

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?