

Name \_\_\_\_\_ Key

UNIT 2 WORKSHEET 19  
FINDING THE EQUATION OF A QUADRATIC FUNCTION

Blue  
Ditto

Find the equation of a parabola that opens up, and has the following x intercepts.

1) (-3,0) and (4,0)

2) (-12,0) and (-3,0)

3) (2,0) and (5,0)

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

$$y = a(x+12)(x+3)$$

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

Find the equation of a parabola that opens down, and has the following x intercepts.

4) (-2,0) and (6,0)

5) (1,0) and (7,0)

6) (5,0)

$$y = -(x+2)(x-6)$$

$$y = -(x-1)(x-7)$$

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

CW

7) Find the equation of a parabola that has a vertex of (-3,2) and contains the point (4,7).

$$y = a(x+3)^2 + 2$$

$$7 = a(4+3)^2 + 2$$

$$7 = 49a + 2$$

$h, k$

$$a = \frac{5}{49}$$

$$y = \frac{5}{49}(x+3)^2 + 2$$

8) Find the equation of a parabola that has a vertex of (4,5) and contains the point (-2,-2).

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

$$-2 = a(-2-4)^2 + 5$$

$$-2 = 36a + 5$$

$h, k$

$$-7 = 36a$$

$$-\frac{7}{36} = a$$

$$y = -\frac{7}{36}(x-4)^2 + 5$$

CW

9) Find the equation of a parabola that has a vertex of (-2,-3) and contains the point (4,1).

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

$$1 = a(4+2)^2 - 3$$

$$1 = 36a - 3$$

$$4 = 36a$$

$$\frac{1}{9} = a$$

$$y = \frac{1}{9}(x+2)^2 - 3$$

10) Find the equation of a parabola that has a vertex of (0,3) and passes the x axis at (7,0).

$$y = a(x)^2 + 3$$

$$0 = 49a + 3$$

$$-3 = 49a$$

$h, k$

$$a = -\frac{3}{49}$$

$$y = -\frac{3}{49}x^2 + 3$$

**Key**

CW

11) Find the equation of a parabola that has a vertex of (3,-1) and has a y intercept of (0,-8).

$$y = a(x-3)^2 - 1$$

$$-8 = 9a - 1$$

h, k

$$-\frac{7}{9} = a$$

$$y = -\frac{7}{9}(x-3)^2 - 1$$

HW

12) Find the equation of a parabola that has a vertex of (5,0) and has a y intercept of (0,-12).

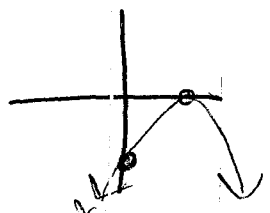
$$y = a(x-5)^2$$

$$-12 = a(0-5)^2$$

$$-12 = 25a$$

$$-\frac{12}{25} = a$$

$$y = -\frac{12}{25}(x-5)^2$$



CW

13) Find the equation of a parabola that passes through (1,6), (2,5) and (0,5).

$$y = ax^2 + bx + c$$

now find a and b.

$$5 = \dots$$

$$6 = 1^2a + 1b + 5$$

$$1 = a + b$$

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

$$5 = 2^2a + 2b + 5$$

$$0 = 4a + 2b$$

$$a = 1 - b$$

Sub

$$0 = 4(1-b) + 2b$$

$$0 = 4 - 4b + 2b$$

$$\rightarrow -4 = -2b$$

$$2 = b$$

$$1 = a + 2$$

$$-1 = a$$

HW

14) Find the equation of a parabola that passes through (0,6), (2,2) and (5,11).

$$y = ax^2 + bx + 6$$

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

Make a System to solve for a and b.

$$2 = 2^2a + 2b + 6$$

$$-4 = 4a + 2b$$

$$-4 = 4(1) + 2b$$

$$-8 = 2b$$

$$-4 = b$$

$$11 = 5^2a + 5b + 6$$

$$5 = 25a + 5b$$

$$1 = 5a + b$$

$$1 = 5a + b$$

$$1 - 5a = b$$

Subst.

$$-4 = 4a + 2(1 - 5a)$$

$$-4 = 4a + 2 - 10a$$

$$-6 = -6a$$

$$1 = a$$

**Key**

15) Find the equation of a parabola that passes through (3,-10), (4,0) and (6,8).

$$y = ax^2 + bx + c$$

$$\textcircled{1} \quad -10 = 9a + 3b + c$$

Try to  
Solve by  
eliminating "c"



$0 = 16a + 4b + c$	$\textcircled{1}$
$8 = 36a + 6b + c$	$\textcircled{2}$
$-10 = 9a + 3b + c$	$\textcircled{3}$

w/ Calc. and Matrix  $\rightarrow$

$a = -2$
$b = 24$
$c = -64$

CW

16) Find the equation of a parabola that passes through (0,6), (-6,0) and (2,16).

$$y = ax^2 + bx + c$$

$$6 = 36a + 6b + c$$

$$0 = 36a - 6b + c$$

$$16 = 4a + 2b + c$$

$$\begin{matrix} -6 & -6 & -6 \\ -6 & -6 & -6 \end{matrix}$$

$$1 = -6a + b$$

Sub

$$10 = 4a + 2(1+6a)$$

$$\textcircled{1 + 6a = b}$$

$$10 = 4a + 2 + 12a$$

$y = \frac{1}{2}x^2 + 4x + 6$
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$$8 = 16a$$

$$\frac{1}{2} = a$$

Sub  $\rightarrow b = 1 + 6(\frac{1}{2})$

$$1 + 3 = 4 = b$$

\*Talk about Finite Differences

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Key

1. If  $g(x) = -x^2 + 2x$ , find the following (expand and simplify fully):

a.  $g(3x)$   
 $-(3x)^2 + 2(3x)$

"horiz shrink by factor of  $\frac{1}{3}$ "

$f(x) = -9x^2 + 6x$

b.  $g(x-1)$   
 horiz shift Rt. 1

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

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

2. For each part below, begin with the function  $g(x) = -x^2 + 2x$ .

chk this in Calc!

a. What is the new function after a horizontal shift of 1 unit right?

$f(x) = -(x-1)^2 + 2(x-1) =$   $-x^2 + 4x - 3$

b. What is the new function after a horizontal shrink of factor  $\frac{1}{3}$ ?

$f(x) = -9x^2 + 6x$

3. What is the axis of symmetry and the vertex of the following functions (show all work):

a.  $g(x) = (x+3)^2 + 5$

$V = (-3, 5)$   
 A.O.S:  $x = -3$

b.  $f(x) = -x^2 - 6x + 3$

$V = (-3, 12)$   
 A.O.S:  $x = -3$

$x = \frac{-b}{2a} = \frac{6}{-2} = -3$   
 $-(-3)^2 - 6(-3) + 3$   
 $-9 + 18 + 3 = 12$

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Alg2

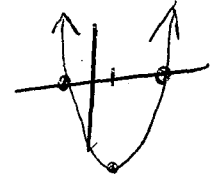
Quadratics Part 1 Review

c.  $y = (x+1)(x-1)$

$V = (1, -1)$

A.O.S.  $> = 1$

Xint  $(-1, 0) (3, 0)$



4. Solve the following system by ELIMINATION:

- ①  $2(2x + y - z = 5)$
- ②  $x + 4y + 2z = 16$
- ③  $15x + 6y - 2z = 12$

①  $4x + 2y - 2z = 10$   
 ②  $x + 4y + 2z = 16$   


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 $5x + 6y = 26$

②  $x + 4y + 2z = 16$   
 ③  $15x + 6y - 2z = 12$   


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 $16x + 10y = 28$

$-10(5x + 6y = 26) \rightarrow -50x - 60y = -260$   
 $6(16x + 10y = 28) \rightarrow 96x + 60y = 168$   


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$46x = -92$

$x = -2$

Sub

~~$x + 4y + 2z = 16$~~

$5(-2) + 6y = 26$   
 $-10 + 6y = 26$   
 $6y = 36$   
 $y = 6$

~~$(-2, 6, 3)$~~   
 $(-2, 6, -3)$

Sub

$-2 + 4(6) + 2z = 16$   
 $22 + 2z = 16$   
 $2z = -6$   
 $z = -3$

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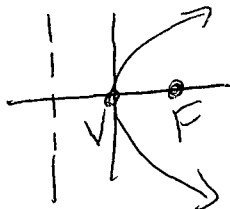
Quadratics Part 1 Review

5. Write an equation of a parabola with the given characteristics (show all work):

a. Focus: (3, 0)

directrix:  $x = -3$

← Sideways Parabola



$V(0,0)$   
 $P=3$

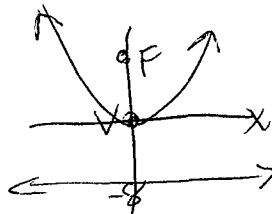
$X = 4p(y-k)^2 + h$

$X = 4 \cdot \frac{1}{3} y^2$

$X = \frac{1}{12} y^2$

b. Directrix:  $y = -8$

vertex: (0, 0)



$F(0,8)$

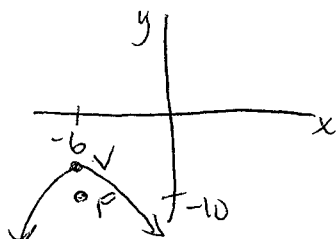
$y = 4p x^2$

$y = \frac{1}{4 \cdot 8} x^2$

$y = \frac{1}{32} x^2$

c. Vertex:  $(-6, -4)$

focus:  $(-6, -10)$



$P = F - V$

$P = -10 - (-4) = -6$

$y = \frac{-1}{24} (x+6)^2 - 4$

6. Identify the focus, directrix, and axis of symmetry of the parabola (show all work):

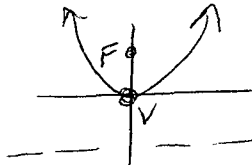
a.  $y = \frac{1}{8} x^2$

F:  $(0, 2)$

D:  $y = -2$

A.O.S.  $x = 0$

$V = (0, 0)$



$\frac{1}{8} = \frac{1}{4p}$

$P = 2$

b.  $y = -\frac{1}{12} x^2$

$-\frac{1}{12} = \frac{1}{4p}$   $P = -3$

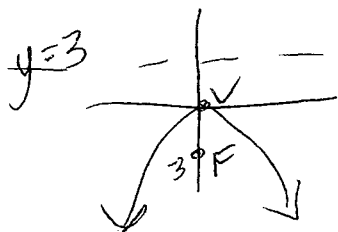
$V = (0, 0)$

$P = F - V$

$F = (0, -3)$

$D = y = 3$

A.O.S.  $x = 0$



Always Sketch  
1) Focus is "Inside" Parabola  
2) "P" can be Pos or Neg. Just like "a".

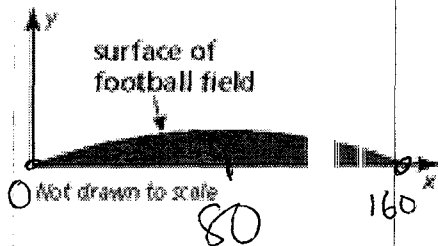
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Quadratics Part 1 Review

7. Although a football field appears to be flat, some are actually shaped like a parabola so that rain runs off to both sides. The cross section of a field can be modeled by  $y = -0.000234x(x - 160)$ , where  $x$  and  $y$  are measured in feet. What is the width of the field? What is the maximum height of the surface of the field?



$$\text{A.O.S. } x = \frac{160+0}{2} = 80$$

$$\boxed{\text{Width} = 160 \text{ ft}}$$

$$\boxed{\text{ht} \approx 1.5 \text{ ft.}}$$

$$y = -0.000234(80)(80-160)$$
$$y = 1.497$$