

Worksheet 4-9: Different Forms of Quadratic Relations

Each quadratic relation has three different ways to write its equation.

<b>Vertex Form:</b>	$y = a(x-h)^2 + k$	(vertex can be easily seen from the equation) vertex = $(h, k)$
<b>Standard Form:</b>	$y = ax^2 + bx + c$	(y-intercept can be easily seen from the equation) y-intercept = $c$
<b>Intercept Form:</b>	$y = a(x-r)(x-s)$	(x-intercepts can be easily seen from the equation) x-intercepts = $r$ and $s$

1. Each relation is in vertex form. Write each relation in standard form. (Hint: Expand)

(a)  $y = -2(x-7)^2$   $k=0$   $v=(7,0)$       (b)  $y = 3(x-5)^2 - 8$   $(5,-8)$

$$y = -2(x-7)(x-7)$$

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

$$= -2x^2 + 28x - 98$$


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$$y = -2(x-7)(x-7)$$

$$= (-2x + 14)(x-7)$$
  

$$y = 3(x-5)(x-5) - 8$$

$$= 3(x^2 - 5x - 5x + 25) - 8$$

$$= 3(x^2 - 10x + 25) - 8$$

$$= 3x^2 - 30x + 75 - 8$$

$$= 3x^2 - 30x + 67$$

2. Each relation is in vertex form. Write each relation in standard form, and in intercept form.

(a)  $y = (x-3)^2 - 36$       (b)  $y = -4(x-5)^2 + 100$

$$y = (x-3)(x-3) - 36$$

$$= x^2 - 3x - 3x + 9 - 36$$

$$y = x^2 - 6x - 27$$

$x^2$	$-27$
$x$	$-9$
$x$	$3$
	$-6$

$$y = (x-9)(x+3)$$
  

$$y = -4(x-5)(x-5) + 100$$

$$= -4(x^2 - 5x - 5x + 25) + 100$$

$$= -4(x^2 - 10x + 25) + 100$$

$$= -4x^2 + 40x - 100 + 100$$

$$y = -4x^2 + 40x$$

$\sqrt{6CF = -4x}$

$$y = -4x(x+10)$$

3. The  $x$ -intercepts of a quadratic relation are also called the "zeros" of a quadratic relation. Find the zeros of each quadratic relation.

(a)  $y = -3(x-7)(x+5)$

①  $x-7=0$

$x=7$

②  $x+5=0$

$x=-5$

Zeros are 7 and -5

zeros =  $x$ -intercepts

(b)  $y = x^2 - 8x$

GCF =  $x$

$y = x(x-8)$

$x=0$  and 8

Zeros are 0 and 8.

(c)  $y = x^2 + 10x + 21$

$x^2$	21
$x$	7
$x$	3
<hr/>	
	10

$y = (x+7)(x+3)$

Zeros are -7 and -3.

(d)  $y = 3x^2 - 24x + 48$  GCF = 3

$y = 3(x^2 - 8x + 16)$

$= 3(x-4)^2$

zero is 4.

$x^2$	16
$x$	-4
$x$	-4
<hr/>	
	-8

(e)  $y = 4x^2 - 64$  GCF = 4

$y = 4(x^2 - 16)$

$x^2$	-16
$x$	-4
$x$	4
<hr/>	
	0

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

Zeros are 4 and -4.

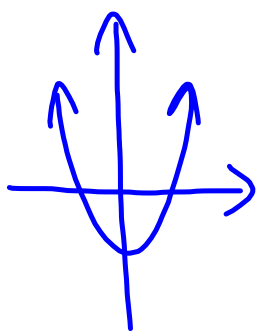
(f)  $y = x^2 + 3x + 25$

No zero.

$x^2$	25
$x$	
$x$	
<hr/>	
	5x5
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	25x1

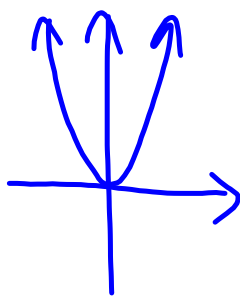
Not factorable

$a > 0$  (opens up)



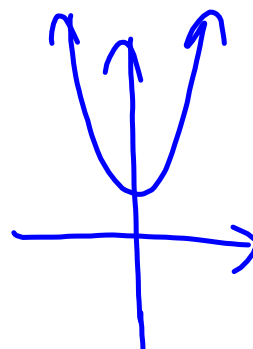
2 zeros

$a > 0, k < 0$  (-)



1 zero

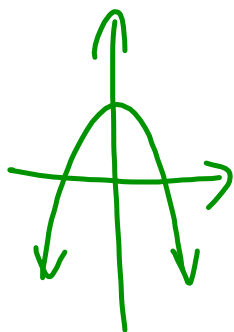
$a > 0, k = 0$



no zero

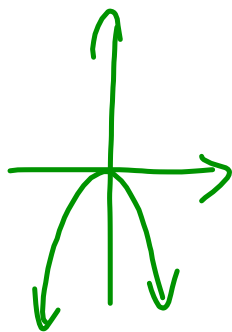
$a > 0, k > 0$  (+)

$a < 0$  (opens down)



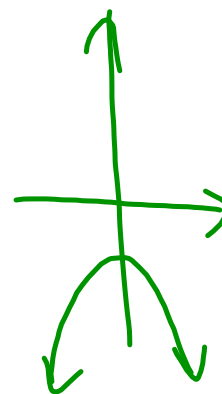
2 zeros

$a < 0, k > 0$  (+)



1 zero

$a < 0, k = 0$



no zero

$a < 0, k < 0$  (-)

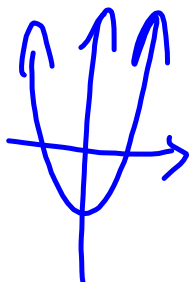
4. Which relation has more than one zero, only one zero, and no zero at all? Explain.  $a < 0$   
 $k > 0$   
 (a)  $y = -5(x+8)^2$   $a < 0, k = 0$  (b)  $y = 3(x-7)^2 + 4$   $a > 0, k > 0$  (c)  $y = -(x+6)^2 + 5$

one zero

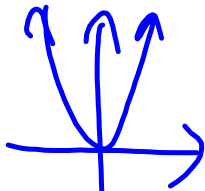
no zero

more than  
one zero

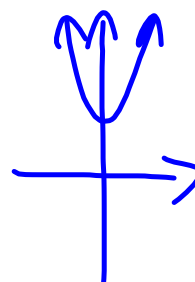
$a > 0$



2 zeros



1 zero



no zero

$a < 0$

