

Quadratic Relations in Factored Form

Key Concepts:

- factored form of quadratic relation
- direction of opening from 'a'
- solving for zeroes
- using symmetry to find:
 - x-coordinate of vertex
 - axis of symmetry
- using substitution to find:
 - y-coordinate of vertex
 - y-intercept

Apr 10-6:32 PM

Is $y = 2(x+1)(x-5)$ a quadratic relation?

Examine 1st and 2nd differences:

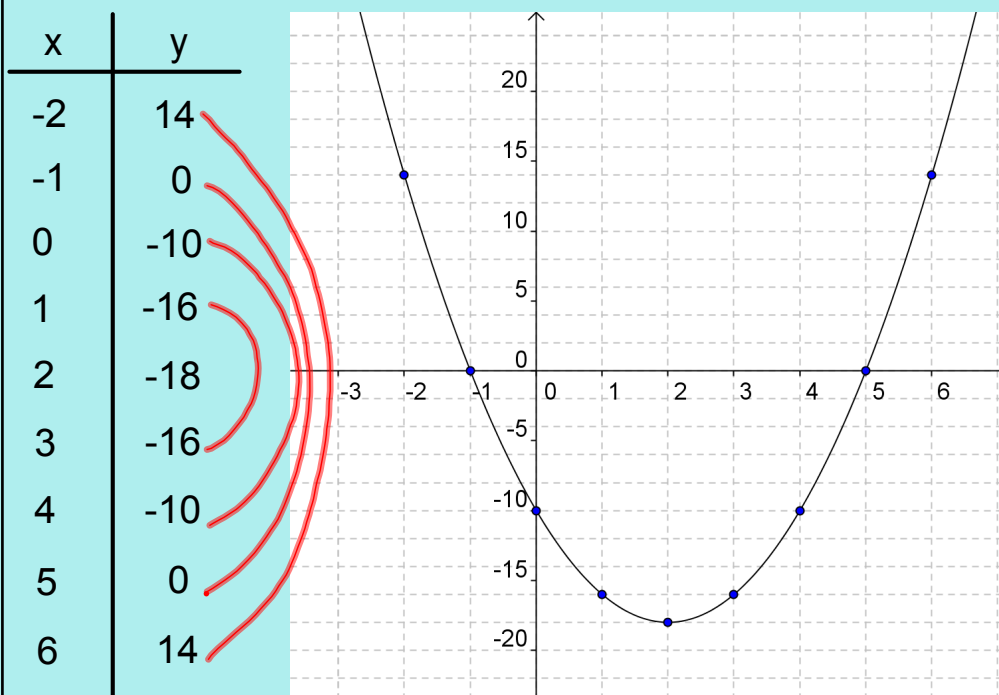
x	y		
-2	14		
-1	0	$0 - 14 = -14$	
0	-10	$-10 - 0 = -10$	$-10 - (-14) = 4$
1	-16	$-16 - (-10) = -6$	$-6 - (-10) = 4$
2	-18	$-18 - (-16) = -2$	$-2 - (-6) = 4$

↓
is a quadratic

Oct 19-8:29 PM

Is $y = 2(x+1)(x-5)$ a quadratic relation?

Graph the relation:



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Quadratic Relations in Factored Form

Oct 20/2011

The equation of a quadratic relation may be written in several forms:

1. standard form: $y = ax^2 + bx + c$

2. factored form: $y = a(x - s)(x - t)$

3. vertex form: $y = a(x - h)^2 + k$

The factored form, $y = a(x - s)(x - t)$, is most useful for finding the zeroes, which are $x = s$ and $x = t$.

Mar 20 - 4:17 PM

Consider the following...

Give two numbers that have a product of zero:

$$6 \times 0 = 0 \quad 1 \times 0 = 0 \quad 0 \times 29 = 0$$

What do you notice? (any value) $\times 0 = 0$

Solve:

(a) $3x = 0$

$$x = 0$$

(b) $57y = 0$

$$y = 0$$

(c) $3xy = 0$

$$x = 0$$

or

$$y = 0$$

Mar 31-8:45 AM

Depending upon the location of the vertex, and whether the parabola opens up or down, it may have 0, 1, or 2 distinct (unique) zeroes.



Zeroes occur where the y-coordinate of the parabola is equal to zero.

Apr 17-11:18 PM

To find the zeroes algebraically, we **set $y = 0$** and solve for the x -values that make the equation true.

Ex.1 Determine the zero(es) of each

(a) $y = x(x - 10)$

Recall:

Zero multiplied by anything is zero.

If $(a)(b) = 0$ then

$a = 0$ or $b = 0$ (or both are zero).

$$0 = x(x - 10)$$

$$x = 0 \text{ OR } x - 10 = 0$$

$$x = 10$$

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

for zeroes, $y = 0$

$$0 = -2(x - 5)(3x - 1)$$

$$x - 5 = 0 \text{ OR } 3x - 1 = 0$$

$$\boxed{x = 5} \quad 3x = 1$$

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

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

set $y = 0$

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

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

$$x - 2 = 0 \text{ OR } x - 2 = 0$$

$$x = 2 \quad x = 2$$

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

$$x - 2 = \pm \sqrt{0}$$

$$x - 2 = \pm 0$$

$$x - 2 = 0$$

$$\rightarrow x = 2$$

Apr 17-11:30 PM

The zeroes and symmetry can be used to find the vertex (h, k) .

For the x -coordinate (h) , find the midpoint of the zeroes:

$$MP_x = \frac{x_1 + x_2}{2} = \frac{s + t}{2}$$

For the y -coordinate (k) , **substitute the midpoint into the equation and solve for y :**

$$y = a(x - s)(x - t)$$

$$y = a(MP - s)(MP - t)$$

Apr 17-11:45 PM

Ex.2 Determine the vertex:

(a) $y = -2(x - 2)(x - 8)$

predict zeroes: $8 + 2$

① Set $y = 0$

$$0 = -2(x - 2)(x - 8)$$

$$x - 2 = 0 \text{ or } x - 8 = 0$$

$$\boxed{x = 2}$$

$$\boxed{x = 8}$$

②
$$MP_x = \frac{2 + 8}{2}$$
$$= 5$$

③ Sub $x = 5$

$$y = -2(5 - 2)(5 - 8)$$

$$= -2(3)(-3)$$

$$= -2(-9)$$

$$y = 18$$

 \therefore the vertex is at $(5, 18)$

Apr 18-12:03 AM

Ex.3 A parabola has zeroes at -3 and 2, and a y-intercept of 18. Determine the equation.

$$y = a(x - s)(x - t)$$
$$= a(x - (-3))(x - (2))$$

Oct 19-9:26 PM

Assigned Work:

p. 155-157 # 2, 3, 4ace, 5, 6ace, 7, 10