

4.1 Factored form, vertex and intercepts

Math 20-2

Objectives:

- Graph a quadratic in the form $y = a(x - r)(x - s)$
- Given the function in factored form: $y = a(x - r)(x - s)$
 - Determine the x-intercepts.
 - Write the equation for the axis of symmetry.
 - Determine the coordinates of the vertex.

Examples:

1. Graph and find the intercepts, equation for the axis of symmetry and the coordinates of the vertex:

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

Find points to plot:

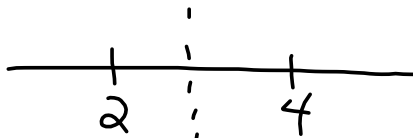
X	Y
1	3
2	0
3	-1
4	0
5	3

solve

$$\begin{aligned}x - 2 &= 0 \\x &= 2\end{aligned}$$

solve

$$\begin{aligned}x - 4 &= 0 \\x &= 4\end{aligned}$$



$$x = 3$$

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

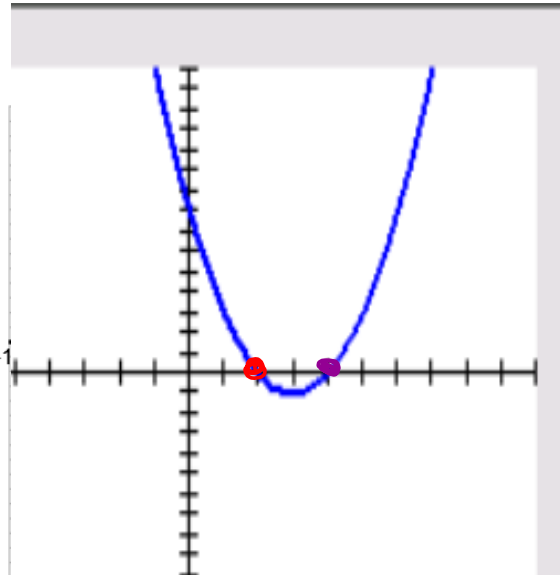
$$y = (3 - 2)(3 - 4)$$

$$y = (1)(-1)$$

$$y = -1$$

$$\text{Vertex } (3, -1)$$

middle = symmetry



4.1 Factored form, vertex and intercepts

1. Graph and find the intercepts, equation for the axis of symmetry and the coordinates of the vertex:

b) $y = (x+5)(x+1)$

Find points to plot:

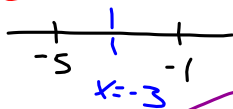
X	Y
-5	0
-4	-3
-3	-4
-2	-3
-1	0

zeros

zeros

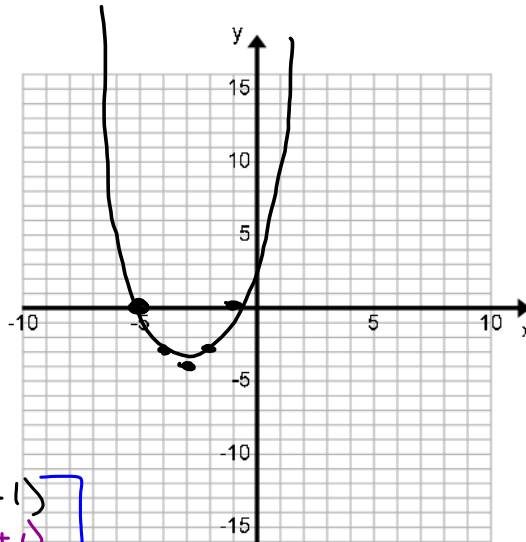
Solve
 $x+5=0$
 $x=-5$

Solve
 $x+1=0$
 $x=-1$



$y = (x+5)(x+1)$
 $y = (-3+5)(-3+1)$
 $y = (2)(-2)$
 $y = -4$

Vertex $V(-3, -4)$



c) $y = -(x+3)(x-1)$

Find points to plot:

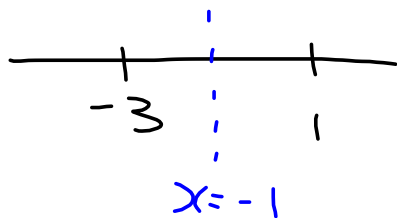
X	Y
-3	0
-2	3
-1	4
0	3
1	0

ZERO

ZERO

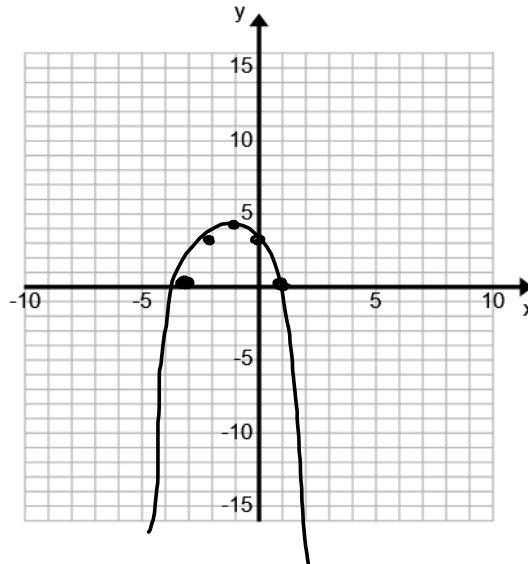
Solve
 $x+3=0$
 $x=-3$

Solve
 $x-1=0$
 $x=1$



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

Vertex $(-1, 4)$



4.1 Factored form, vertex and intercepts

- What is the pattern for finding the x-intercepts of a quadratic in factored form?

each factor equals zero ...
then solve.

- What is the pattern for finding the equation of the axis of symmetry of a quadratic in factored form?

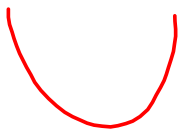
found middle of zeros (x-intercepts)

- What is the pattern for finding the vertex of a quadratic in factored form?

use symmetry and solve for y:

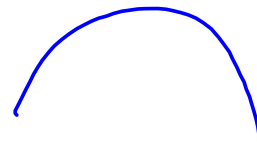
- Given factored form $y = a(x - r)(x - s)$. What does "a" tell us about our function?

a = positive



opens up

a = negative



opens down

4.1 Factored form, vertex and intercepts

I. factor : zero
 II. middle (sym)

2. Find the x-intercepts and the vertex of: III vertex $x =$

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

$$x - 6 = 0 \quad x + 2 = 0$$

$$x = 6 \quad x = -2$$

$\frac{-2+6}{2} = \frac{4}{2} = 2$

$y = (2-6)(2+2)$
 $y = (-4)(4)$
 $y = -16$

Vertex $(2, -16)$

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

$$x - 6 = 0 \quad x + 2 = 0$$

$$x = 6 \quad x = -2$$

$y = 2(2-6)(2+2)$
 $y = 2(-4)(4)$
 $y = -32$

Vertex $(2, -32)$

c) $y = -\frac{1}{2}(x + 8)(x - 4)$

$$x + 8 = 0 \quad x - 4 = 0$$

$$x = -8 \quad x = 4$$

$\frac{-8+4}{2} = \frac{-4}{2} = -2$

$y = -\frac{1}{2}(-2+8)(-2-4)$
 $y = -\frac{1}{2}(6)(-6)$
 $y = 18$

Vertex $(-2, 18)$



d) $y = (2x - 3)(2x + 1)$