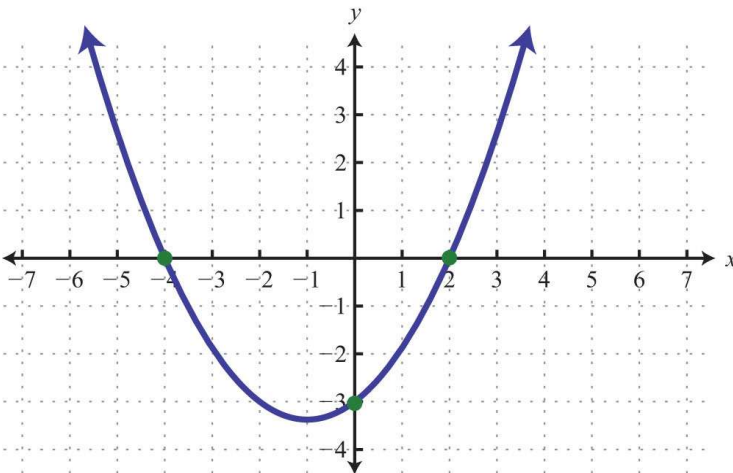


2.9 The X-Intercepts of a Relation

- The **x-intercepts** are where the graph crosses the x-axis.
- They are also called **zeros**.
- They are the points where the **$y=0$** .
- **Factored form** is the easiest form to find the x-intercepts.

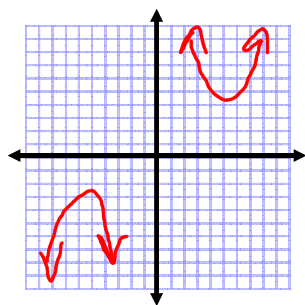


Zeros

- A parabola can have 0, 1 or 2 zeros....draw them below...

Cases:

no zeros

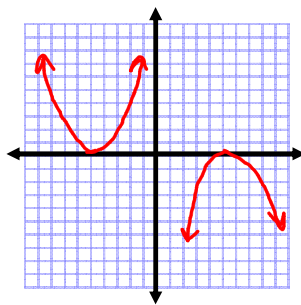


In Words:

vertex is above
x axis and opens up
OR

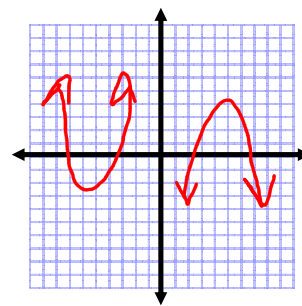
vertex is below x axis
and open down

1 zero



vertex is on
x axis
opens up or
down

2 zeros



vertex is below
x axis and opens up
OR
vertex is above x axis
and open down



When the equation is in vertex form we can determine how many zeros each relation has by looking at the vertex and the direction of opening.

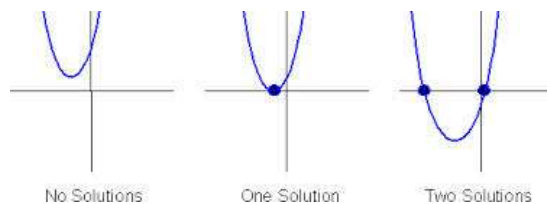
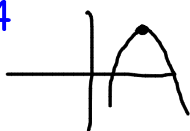
Ex 1: Determine the number of zeros

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

- Vertex Above

- Opens down

\therefore 2 zeros



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

$V(-4, 0) \rightarrow$ ON x-axis
 $\rightarrow \therefore$ 1 zero

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

$V(2, 5) \rightarrow$ ABOVE

\rightarrow Opens UP

\therefore 0 zeros

Factored Form: $y = a(x - r)(x - s)$

the zeros/x-intercepts are r and s

(we can see this by setting each factor = 0 and solving)



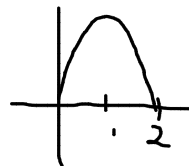
Ex.2 Find the zeros.

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

$$\begin{array}{cc} \swarrow & \searrow \\ x=4 & x=-3 \\ (4,0) & (-3,0) \end{array}$$

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

$$\begin{array}{cc} \swarrow & \searrow \\ x=0 & x=2 \\ (0,0) & (2,0) \end{array}$$



c) $y = -4(x + 1)^2$

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

$$x = -1$$

$$(-1, 0)$$

↗
Also the vertex!

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

$$\begin{array}{cc} \swarrow & \searrow \\ x=-5 & x=5 \\ (-5,0) & (5,0) \end{array}$$

Ex. 3 Find the zeros by factoring. *GCF*, then *MAN*, set $y=0$, solve!

Core Lesson

Finding the zeros

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

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

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

$-4+4=0$

$x+4=0$
 $\frac{-4 \quad -4}{x = -4}$

$x-1=0$
 $\frac{+1 \quad +1}{x = 1}$

$1-1=0$

a) $y = x^2 + 6x + 8$

M 8 $y = (x+2)(x+4)$

A 6 ↓ ↓

N 2,4 $x = -2$ $x = -4$

b) $y = 3x^2 + 12x + 12$

$y = 3(x^2 + 4x + 4)$

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

↓

$x = -2$

c) $y = 3x^2 + 6x$

M: 0 $y = 3(x^2 + 2x)$

A: 2 $y = 3(x)(x+2)$

N: 0, 2

↓ ↓

$x = 0$ $x = -2$

d) $y = 2x^2 - 18$

$y = 2(x^2 - 9)$

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

↙ ↓

$x = 3$ $x = -3$

M: -9

A: 0

N: -3, 3

Homework
page 272
#2, 3bdf, 4bdf, 5bdf

