

3.9 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.

Let's investigate with desmos to figure out how you can find the zeros from factored form:

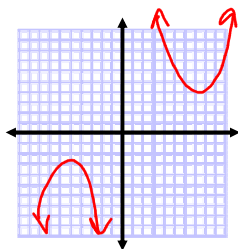
Desmos

Zeros

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

Cases:

no zeros

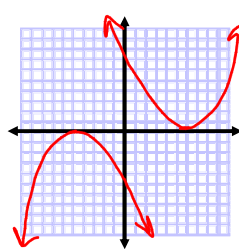


In Words:

vertex is above x axis and opens up
OR

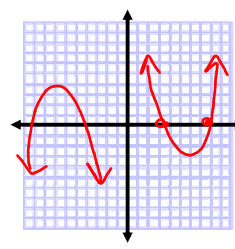
vertex is below x axis and open down

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 $(2, 4)$
 Opens DOWN 
 2 zeros

b) $y = -2(x+4)^2$
 Vertex $(-4, 0)$
 Opens Down 
 \therefore One zero

c) $y = 3(x-2)^2 + 5$
 Vertex $(2, 5)$
 Opens UP 
 \therefore No 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) $y = 2(x-4)(x+3)$
 $x-4=0$ $x+3=0$
 $x=4$ $x=-3$

b) $y = 3x(x-2)$
 $x=0$ $x-2=0$
 $x=2$

c) $y = -4(x+1)^2$
 $= -4(x+1)(x+1)$
 $x+1=0$
 $x=-1$

d) $y = -2(x+5)(x-5)$
 $x+5=0$ $x-5=0$
 $x=-5$ $x=5$
 $(x = \pm 5)$

