

5.2 Finding Zeros of Polynomials

IF.5 I can find the 'zeros' of polynomial functions

What is a polynomial function? A function with positive values for exponents. For example $x^4 + 3x^2 + 2$ or $x^2 - 3x$

Standard Form	Factored Form
$3x^4 + 6x^2$	$3x^2(x^2 + 2)$
$x^2 + 5x + 6$	$(x + 2)(x + 3)$

ZEROS OF A POLYNOMIAL FUNCTION

Other Names for Zeros:

These are all the same!

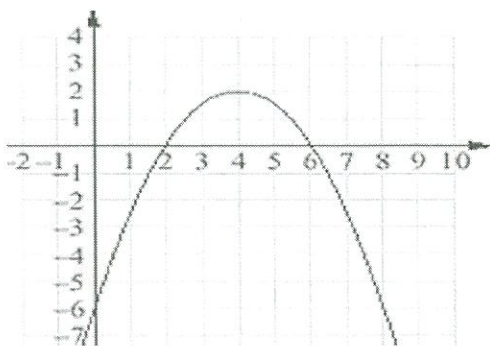
Zeros
= where the polynomial equals zero

Solutions
x = ^{Answer}
- what x equals when the poly is zero

Roots
- where the graph touches the x-axis

Finding zeros on a graph of a polynomial function:

Zeros are the x-values where y=0.



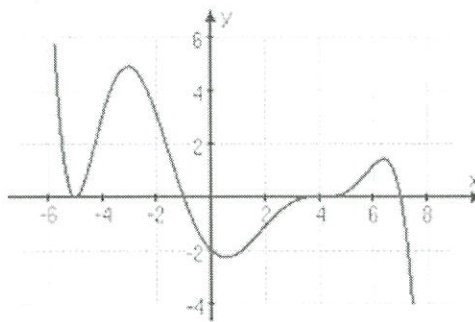
Zeros:

$x = 2$

$x = 6$

X-intercepts:

$(2, 0), (6, 0)$

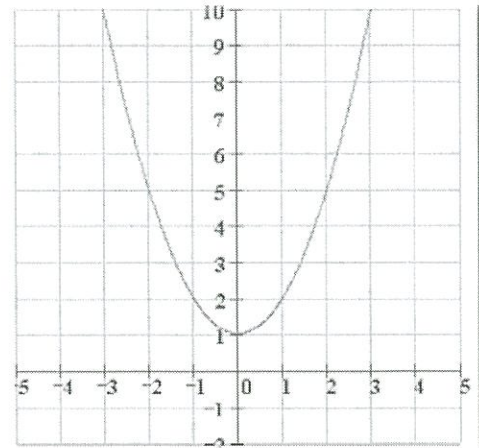


Zeros:

$x = -5, -1, 4, 7$

X-intercepts:

$(-5, 0), (-1, 0), (4, 0), (7, 0)$



Zeros:

No real zeros

X-intercepts:

None

Factors, Roots, Zeros

Example: $x^2 + 2x - 15$

3) Write Equation

$$x^2 + 2x - 15 = 0$$

2) Factor

$$(x + 5)(x - 3) = 0$$

1) Solve by setting each factor = 0

$x + 5 = 0$	$x - 3 = 0$
$x = -5$	$x = 3$

↑ ↑
These are your solutions/roots

Remember! Only ONE factor needs to be zero in order for the product to be zero.

Let's work on just the "solving" part. Here we are finding the zeros of the polynomial algebraically.

Try These:

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

$x = 0$	$x - 2 = 0$
	$x = 2$

2) $3(x + 4) = 0$

$3 \neq 0$ $x + 4 = 0$

$x = -4$

3) $4x(x + 1) = 0$

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

4) $(x - 5)(x + 8) = 0$

$x - 5 = 0$	$x + 8 = 0$
$x = 5$	$x = -8$

5) $(x + 6)(x - 4)(x + 3) = 0$

$x + 6 = 0$	$x - 4 = 0$	$x + 3 = 0$
$x = -6$	$x = 4$	$x = -3$

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

$x = 0$	$x + 2 = 0$	$x - 2 = 0$
	$x = -2$	$x = 2$

7) $3x(4x + 5) = 0$

$3x = 0$	$4x + 5 = 0$
$x = 0$	$4x = -5$
	$x = -5/4$

8) $(6x - 1)(7x + 3) = 0$

$6x - 1 = 0$	$7x + 3 = 0$
$6x = 1$	$7x = -3$
$x = 1/6$	$x = -3/7$

9) $(10x + 13)(3x - 1)(x + 2) = 0$

$10x + 13 = 0$	$3x - 1 = 0$	$x + 2 = 0$
$10x = -13$	$3x = 1$	$x = -2$
$x = -13/10$	$x = 1/3$	

10) $4x(x + 8)(2x - 3) = 0$

$4x = 0$	$x + 8 = 0$	$2x - 3 = 0$
$x = 0$	$x = -8$	$2x = 3$
		$x = 3/2$

Bonus! If you were to graph these polynomials, what would the x-intercepts be?

1) $(0, 0)$
 $(2, 0)$

2) $(-4, 0)$

3) $(0, 0)$ $(-1, 0)$

4) $(5, 0)$ $(-8, 0)$

5) $(-6, 0)$ $(4, 0)$ $(-3, 0)$

6) $(0, 0)$ $(-2, 0)$ $(2, 0)$

7) $(0, 0)$ $(-5/4, 0)$

8) $(1/6, 0)$ $(-3/7, 0)$

9) $(-13/10, 0)$ $(1/3, 0)$ $(2, 0)$

10) $(0, 0)$ $(-8, 0)$ $(3/2, 0)$