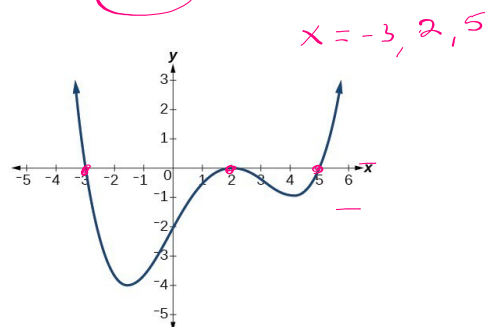


10-1 Zeros of a Polynomial

Objectives:

- I can determine zeros from a graph
- I can verify a value is a zero
- I can find all zeros, given one

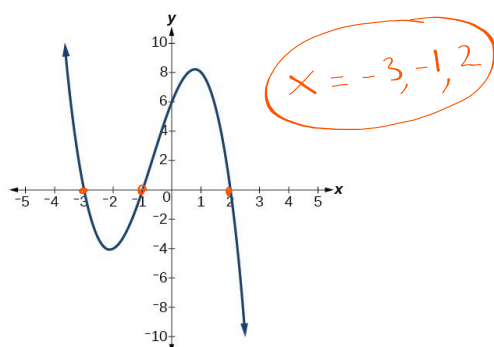
The Zero of a polynomial is the x-value where the function equals 0. On a graph, this is the x-value where the graph crosses the x-axis



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Identify the zeros from the following graph



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Verifying Zeros

You can determine if a value is a zero by using synthetic division

If the remainder after dividing is 0, then the value is a zero of the function. If the remainder is anything but 0, then the value is not a zero

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Is $x = -4$ a zero of $f(x) = 3x^2 + 7x - 20$

$$\begin{array}{r|rrrr} -4 & 3 & 7 & -20 & \\ & & -12 & 20 & \\ \hline & 3 & -5 & 0 & \end{array}$$

Yes

Is $x = 1$ a zero of $f(x) = x^3 - 4x^2 + x + 6$

$$\begin{array}{r|rrrrr} 1 & 1 & -4 & 1 & 6 & \\ & & 1 & -3 & -2 & \\ \hline & 1 & -3 & -2 & 4 & \end{array}$$

Nah

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Finding All Zeros

Once we verify a value is a 0, we can find all other zeros by factoring.

* Process: *

- 1) - Divide using synthetic division
- 2) - Write out the answer
- 3) - Factor
- 4) - Solve for x in each factor

Given $x = 3$ is a zero, find all other zeros of

Step 1) $f(x) = x^3 - 4x^2 + x + 6$

$$\begin{array}{r|rrrr} 3 & 1 & -4 & 1 & 6 \\ & & 3 & -3 & -6 \\ \hline & 1 & -1 & -2 & 0 \end{array}$$

Step 2) $x^2 - x - 2$

Step 3) $(x-2)(x+1)$

Step 4) $x-2=0 \quad x+1=0$
 $x=2 \quad x=-1$

$x = 3, 2, -1$

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8)

$$\begin{array}{r} .5 \overline{) 1 \quad -9 \quad 23 \quad -15} \\ \underline{.5 \quad -2.0 \quad 15} \\ 1 \quad -4 \quad 3 \quad 0 \end{array}$$

$x^2 - 4x + 3$

$(x-3)(x-1)$

$x = 3, 1, .5$

$\frac{3}{-3} \overline{) 1 \quad -1}$

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Given $x = -1$ is a zero, find all the zeros of

$$f(x) = x^3 + 5x^2 - x - 5$$

$$\begin{array}{r} -1 \overline{) 1 \quad 5 \quad -1 \quad -5} \\ \underline{-1 \quad -4 \quad 5} \\ 1 \quad 4 \quad -5 \quad 0 \end{array}$$

$x^2 + 4x - 5$

$(x+5)(x-1)$

$x = -5, 1, -1$

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Given $x=1$ is a zero, find all other zeros of

$$f(x) = x^3 - 7x^2 - x + 7$$

$$\begin{array}{r} 1 \overline{) 1 \quad -7 \quad -1 \quad 7} \\ \underline{1 \quad -6 \quad -7} \\ 1 \quad -6 \quad -7 \quad 0 \end{array}$$

$x^2 - 6x - 7$

$(x-7)(x+1)$

$x = 7, -1, 1$

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