

3.1 Zeros of a Polynomial

Book Pages: 371-372

Objectives:

- I can find the zeroes of a polynomial using synthetic division and my calculator
- I can distinguish between zeros and factors

Divide the following polynomials

$$\begin{array}{r} 3x - 5 \quad R: 0 \\ x + 4 \overline{) 3x^2 + 7x - 20} \\ \underline{-3x^2 - 12x} \\ -5x - 20 \\ \underline{+5x + 20} \\ 0 \end{array}$$

$$\boxed{3x - 5} \quad R: 0$$

$$\begin{array}{r} 2x^4 - 5x^3 + 7x^2 - 3x + 1 \\ \hline x - 3 \overline{) 2x^4 - 5x^3 + 7x^2 - 3x + 1} \\ \underline{2x^4 - 6x^3 + 18x^2 - 9x + 3} \\ 2x^3 + 1x^2 + 10x - 2 \\ \underline{2x^3 - 6x^2 + 18x - 6} \\ 7x^2 - 5x + 8 \\ \underline{7x^2 - 21x + 21} \\ 8x - 13 \\ \underline{8x - 24} \\ 13 \end{array}$$

$$\boxed{2x^3 + x^2 + 10x + 27} \quad R: 82$$

Identify the zeros of the following and explain what that means graphically. what makes each factor = 0

crosses x-axis \uparrow $f(x) = (x+2)(x-1)(x+3)$

zeros: $x = -2, 1, -3$

Write the function in standard form and state the relationship between the degree and zeros of the function

\uparrow
multiply it out

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

$$(x^2 - x + 2x - 2)(x+3)$$

$$(x^2 + x - 2)(x+3)$$

$$x^3 + 3x^2 + x^2 + 3x - 2x - 6$$

$$x^3 + 4x^2 + x - 6$$

Degree: 3 } always match!
of zeros: 3 }

Your Turn

Determine whether the given binomial is a factor of the polynomial $p(x)$. If it is, find the remaining factors of $p(x)$.

8. $p(x) = 2x^4 + 8x^3 + 2x + 8; (x+4)$

$$\begin{array}{r} -4 \overline{) 2 \ 8 \ 0 \ 2 \ 8} \\ + \downarrow -8 \ 0 \ 0 \ -8 \\ \hline \end{array}$$

$$2x^3 + 0x^2 + 0x + 2 \quad \boxed{0}$$

\uparrow Divide & look for $R=0$

$x+4$ is a factor

9. $p(x) = 3x^3 - 2x + 5; (x-1)$

$$\begin{array}{r} 1 \overline{) 3 \ 0 \ -2 \ 5} \\ + \downarrow 3 \ 3 \ 1 \\ \hline \end{array}$$

$$3 \ 3 \ 1 \quad \boxed{6}$$

$R \neq 0$

$(x-1)$ is NOT a factor

Find the factors and zeros of the polynomial

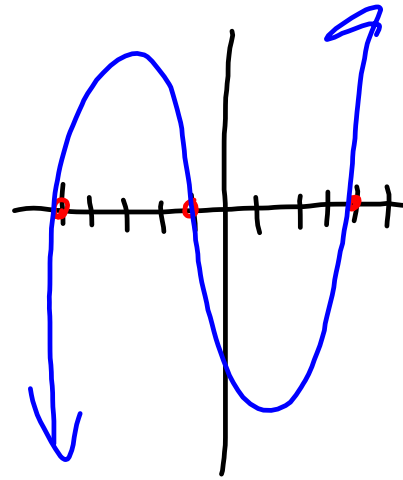
Graph & find zeros

$$f(x) = x^3 + 2x^2 - 19x - 20$$

zeros: $x = -5, -1, 4$

$$(x+5)(x+1)(x-4)$$

factors



Find the factors and zeros of the polynomial

$$x^3 - 2x^2 - 41x + 42$$

$$x = -6, 1, 7$$

Factors

$$(x+6)(x-1)(x-7)$$

Find the factors and zeros of the polynomial

$$f(x) = x^4 - 4x^3 - 7x^2 + 22x + 24$$

Find the factors and zeros of the polynomial

$$f(x) = x^3 - 2x^2 - 8x$$

Find all the zeros of: $2x^4 - 7x^3 - 8x^2 + 14x + 8$

Find all the zeros of: $f(x) = x^3 + x^2 - 14x + 6$

