

HAT

More Graphing Polynomials

10/6/17

Warm Up: Find the QUOTIENT and REMAINDER when
 $x^3 + 9x^2 + 11x - 21$ is divided by $x + 3$ (NC)

Quotient: $x^2 + 6x - 7$ remainder = 0

Ex#1: Given $f(x) = x^3 + 9x^2 + 11x - 21$ (NC)

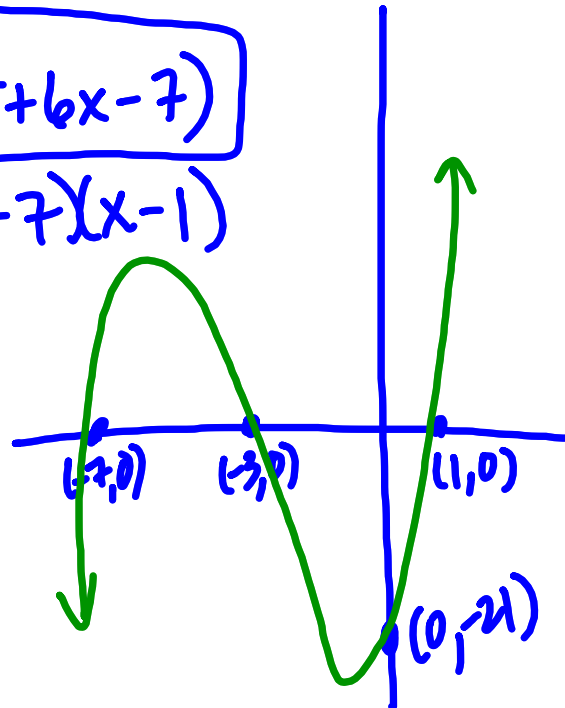
- factor completely
- graph

$$f(x) = (x+3)(x^2+6x-7)$$

$$f(x) = (x+3)(x+7)(x-1)$$

x-int: (-3,0) (-7,0) (1,0)
y-int: (0,-21)

- Shape
- Smooth and Continuous
- Leading Coefficient
- End Behavior
- Multiplicity



Ex#2: For the polynomial $f(x) = \underline{2}x^3 + 3x^2 - 8x + \underline{3}$ (NC)

- make a list of all possible rational zeros
- given factor $(2x-1)$ factor completely
- graph

$$\frac{\pm \text{factors of the constant}}{\text{factors of the leading coefficient}} = \frac{\pm \text{factors of 3}}{\text{factors of 2}}$$

$$\frac{\pm 1, 3}{\pm 1, 2} = \left(\pm 1, \frac{1}{2}, 3, \frac{3}{2} \right)$$

$$2x-1=0$$

$$x = \frac{1}{2}$$

- Shape
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- Multiplicity

$$\begin{array}{r|rrrr} \frac{1}{2} & 2 & 3 & -8 & 3 \\ & \downarrow & & & \\ \hline & 2 & 4 & -6 & 0 \end{array}$$

$$f(x) = \left(x - \frac{1}{2}\right)(2x^2 + 4x - 6)$$

$$f(x) = \left(x - \frac{1}{2}\right) \cdot 2(x^2 + 2x - 3)$$

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

Ex#3: For the polynomial $g(x) = 2x^4 + 7x^3 - 4x^2 - 27x - 18$

- make a list of all possible rational zeros
- given **x-intercept** $(-\frac{3}{2}, 0)$, factor completely
- graph

possible rational zeros: $\pm \frac{1, 2, 3, 6, 9, 18}{1, 2}$

$\pm 1, 2, 3, 6, 9, 18, \frac{1}{2}, \frac{3}{2}, \frac{9}{2}$

- Shape
- Smooth and Continuous
- Leading Coefficient
- End Behavior
- Multiplicity

$$\begin{array}{r} -\frac{3}{2} \bigg| 2 \quad 7 \quad -4 \quad -27 \quad -18 \\ \phantom{-\frac{3}{2} \bigg|} \downarrow -3 \quad -6 \quad 15 \quad +18 \\ \hline 2 \quad 4 \quad -10 \quad -12 \quad \underline{0} \end{array}$$

$$g(x) = (x + \frac{3}{2})(2x^3 + 4x^2 - 10x - 12)$$

$\pm \frac{1, 2, 3, 6}{1}$

$$g(x) = (2x + 3)(x^3 + 2x^2 - 5x - 6)$$

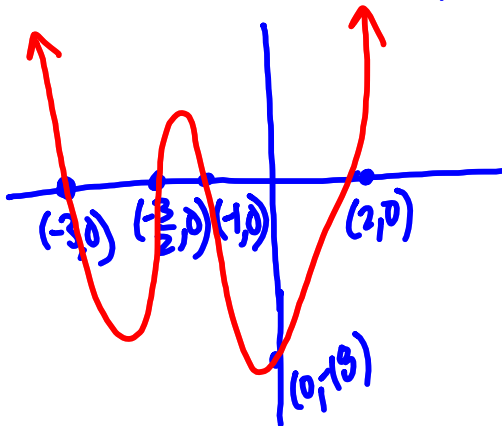
$$\begin{array}{r} 2 \bigg| 1 \quad 2 \quad -5 \quad -6 \\ \downarrow 2 \quad 8 \quad 6 \\ \hline 1 \quad 4 \quad 3 \quad \underline{0} \end{array}$$

$$g(x) = (2x + 3)(x - 2)(x^2 + 4x + 3)$$

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

x-int: $(-\frac{3}{2}, 0)$
 $(2, 0)$
 $(-1, 0)$
 $(-3, 0)$

y-int: $(0, -18)$



Ex#4: Graph $f(x) = x^4 + 2x^3 - 13x^2 - 14x + 24$ (NC)

possible rational zeros: $\pm 1, 2, 3, 4, 6, 8, 12, 24$

$$\begin{array}{r|rrrrr}
 1 & 1 & 2 & -13 & -14 & 24 \\
 & \downarrow & & & & \\
 \hline
 3 & 1 & 3 & -10 & -24 & 0 \\
 & \downarrow & & & & \\
 \hline
 & 1 & 6 & 8 & 0 &
 \end{array}$$

- Shape
- Smooth and Continuous
- Leading Coefficient
- End Behavior
- Multiplicity

$$f(x) = (x-1)(x-3)(x^2+6x+8)$$

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

Assignment: Enjoy Homecoming!