

5.7 day 2 Notes: Finding Roots of Polynomials

Warm - Up:

1) Write the factors then find the simplest function with the given roots

$x = 2, -3, 1$

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

$$\quad \quad \quad \underbrace{\hspace{2cm}}_{(x^2+x-6)}$$

$$(x+1)(x^2+x-6)$$

$$= \frac{x^3 + x^2 - 6x}{x^2 + x - 6}$$

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

2) solve: $f(x) = x^4 - 8x^3 + 20x^2 - 32x + 64$

- a) Based on the degree, how many roots/solutions are there?
- b) Graph the function and list the real roots; note multiplicity
- c) use synthetic division to reduce to quadratic or lower
- d) solve for remaining roots.

4 solutions
 $x = 4$ w/ mult. of 2

$$\begin{array}{r} 4 \mid 1 \quad -8 \quad 20 \quad -32 \quad 64 \\ + \downarrow 4 \quad -16 \quad 16 \quad -64 \\ \hline 1 \quad -4 \quad 4 \quad -16 \quad 0 \end{array}$$

$$\begin{array}{r} 4 \mid + \downarrow 4 \quad 0 \quad 16 \\ \hline 1 \quad 0 \quad 4 \quad 0 \end{array}$$

$x^2 + 4 = 0$

$$x^2 + 4 = 0$$

$$\quad -4 \quad -4$$

$$\sqrt{x^2} = \sqrt{-4}$$

$$x = \pm 2i$$

Solutions:

$x = 4$ mult of 2

$x = \pm 2i$

3) solve: $f(x) = 2x^4 + 3x^3 - 26x^2 - 15x + 36$

- a) Based on the degree, how many roots/solutions are there?
- b) Graph the function and list the real roots.
- c) use synthetic division to reduce to quadratic or lower
- d) solve for the remaining roots

4 solutions
 $x = -4, 1, 3, \frac{3}{2}$?

$$\begin{array}{r} -4 \mid 2 \quad 3 \quad -26 \quad -15 \quad 36 \\ + \downarrow -8 \quad 20 \quad 24 \quad -36 \\ \hline 2 \quad -5 \quad -6 \quad 9 \quad 0 \end{array}$$

$$\begin{array}{r} 1 \mid + \downarrow 2 \quad -3 \quad -9 \\ \hline 2 \quad -3 \quad -9 \quad 0 \end{array}$$

$$\begin{array}{r} 3 \mid + \downarrow 6 \quad 9 \\ \hline 2 \quad 3 \quad 0 \end{array}$$

$2x + 3 = 0$

$$2x + 3 = 0$$

$$\quad -3 \quad -3$$

$$\frac{2x}{2} = \frac{-3}{2}$$

$$x = -\frac{3}{2}$$

Solutions:

$x = -4, 1, 3, \frac{3}{2}$

