

Extra Example

Section 3-6

Oct 15

If $1/3$ is a zero of $f(x) = 9x^5 - 9x^4 - 13x^3 - x^2 - 22x + 8$,

a) find all zeros: $2, \frac{1}{3}, \pm i, -\frac{4}{3}$

$$\begin{array}{r|rrrrrr} \frac{1}{3} & 9 & -9 & -13 & -1 & -22 & 8 \\ & & 3 & -2 & -5 & -2 & -8 \\ \hline & 9 & -6 & -15 & -6 & -24 & 0 \end{array}$$

$$\div 3 \begin{array}{r} 9x^4 - 6x^3 - 15x^2 - 6x - 24 \\ 3x^4 - 2x^3 - 5x^2 - 2x - 8 \end{array}$$

$$\begin{array}{r|rrrr} 2 & 3 & -2 & -5 & -2 & -8 \\ & & 6 & 8 & 6 & 8 \\ \hline & 3 & 4 & 3 & 4 & 0 \end{array}$$

$$\begin{array}{l} (3x^3 + 4x) + (3x + 4) \\ x^2(3x+4) + 1(3x+4) = 0 \\ (x^2+1)(3x+4) = 0 \end{array}$$

$$\frac{c}{b} = \pm(8, 4, 2, 1) \quad \pm i, -4/3$$

$$\frac{c}{b} = \pm(8, 8, 4, 4, 2, 2, 1, 1)$$

b) write $f(x)$ in factored form with linear factors

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

$\left(\begin{array}{l} x=1/3 \\ 3x-1=0 \end{array} \right)$ $\left(\begin{array}{l} x=2 \\ x^2-4=0 \end{array} \right)$ $\left(\begin{array}{l} i \\ -i \\ x^2-i^2 \\ (x^2+1) \end{array} \right)$

c) graph $f(x)$

$$\begin{array}{r|l} x & y \\ -1 & (-4)(-3)(1)(2) = 24 \\ 0 & 8 \\ 1 & 2(-1)(7)(2) = -28 \end{array}$$

