

MAT 142 Homework #5 Key

a.  $f(x) = 2x^3 - 11x^2 + 7x - 5$

$f(4) = -25$

$$\begin{array}{r} 2x^2 - 3x - 5 \\ x-4 \overline{) 2x^3 - 11x^2 + 7x - 5} \\ \underline{-2x^3 + 8x^2} \phantom{-5} \\ -3x^2 + 7x - 5 \\ \underline{+3x^2 - 12x} \\ -5x - 5 \\ \underline{+5x + 20} \\ -25 \end{array}$$

b.  $f(x) = 4x^3 + 5x^2 - 6x - 4$

$f(-2) = -4$

c.  $f(x) = x^4 - 5x^3 + 5x^2 + 5x - 6$

$f(2) = 0$

$$\begin{array}{r} -2 \overline{) 4 \quad 5 \quad -6 \quad -4} \\ \underline{-8 \quad 6 \quad 0} \\ 4 \quad -3 \quad 0 \quad -4 \end{array}$$

2a.  $f(x) = x^3 + x^2 - 4x - 4$

$\pm 1, \pm 2, \pm 4$

$$\begin{array}{r} 2 \overline{) 1 \quad -5 \quad 5 \quad 5 \quad -6} \\ \underline{2 \quad -6 \quad -2 \quad 6} \\ 1 \quad -3 \quad -1 \quad 3 \quad 0 \end{array}$$

b.  $f(x) = 3x^4 - 11x^3 - x^2 + 19x + 6$

$\pm 1, \pm 2, \pm 3, \pm 6, \pm 1/3, \pm 2/3$

c.  $f(x) = x^4 - x^3 + 5x^2 - 2x - 6$

$\pm 1, \pm 2, \pm 3, \pm 6$

3a.  $f(x) = x^3 - 2x^2 - 11x + 12$

$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

$$\begin{array}{r} 1 \overline{) 1 \quad -2 \quad -11 \quad 12} \\ \underline{1 \quad -1 \quad -12} \\ 1 \quad -1 \quad -12 \quad 0 \end{array}$$

$(x-1)(x^2 - x - 12)$

$(x-1)(x-4)(x+3) = 0 \quad x = 1, 4, -3$

b.  $f(x) = x^3 - 5x^2 + 17x - 13$

$\pm 1, \pm 13$

$$\begin{array}{r} 1 \overline{) 1 \quad -5 \quad 17 \quad -13} \\ \underline{1 \quad -4 \quad 13} \\ 1 \quad -4 \quad 13 \quad 0 \end{array}$$

$(x-1)(x^2 - 4x + 13) = 0$

$x = \frac{4 \pm \sqrt{16 - 52}}{2} = \frac{4 \pm 6i}{2} = 2 \pm 3i, x = 1$

$$3c. f(x) = x^4 - 2x^3 - 5x^2 + 8x + 4$$

$$\pm 1, \pm 2, \pm 4$$

$$(x-2)(x^3 - 5x - 2)$$

$$\pm 1, \pm 2$$

$$(x-2)(x+2)(x^2 - 2x - 1) = 0$$

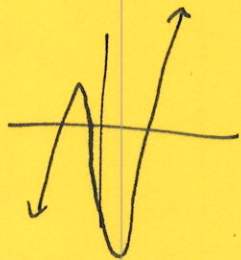
$$x = \frac{2 \pm \sqrt{4+4}}{2} = \frac{2 \pm 2\sqrt{2}}{2}$$

$$= 1 \pm \sqrt{2}$$

$$x = 1 \pm \sqrt{2}, \pm 1, \pm 2$$

$$4a. f(x) = 2x^3 - x^2 - 9x - 4$$

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



$$(x^2 - x - 4)(2x + 1) = 0$$

$$x = \frac{1 \pm \sqrt{1+16}}{2} = \frac{1 \pm \sqrt{17}}{2}, x = -\frac{1}{2}$$

$$b. f(x) = x^4 - 2x^3 + x^2 + 12x + 8$$

$$x = -1 \text{ (repeated)}$$

$$(x+1)^2(x^2 - 4x + 8) = 0$$

$$x = \frac{4 \pm \sqrt{16-32}}{2} = \frac{4 \pm 4i}{2} = 2 \pm 2i$$

$$x = 2 \pm 2i, x = -1$$

(2)

$$1 \overline{) \begin{array}{cccc|c} 1 & -2 & -5 & 8 & 4 \\ & & 1 & -1 & -6 & 2 \\ \hline 1 & -1 & -6 & 2 & -6 & \end{array}} \quad \text{not a zero}$$

$$-1 \overline{) \begin{array}{cccc|c} 1 & -2 & -5 & 8 & 4 \\ & & -1 & 3 & 2 & -10 \\ \hline 1 & -3 & -2 & 10 & -6 & \end{array}} \quad \text{not a zero}$$

$$2 \overline{) \begin{array}{cccc|c} 1 & -2 & -5 & 8 & 4 \\ & 2 & 0 & -10 & -4 \\ \hline 1 & 0 & -5 & -2 & 0 & \end{array}}$$

$$2 \overline{) \begin{array}{ccc|c} 1 & 0 & -5 & -2 \\ & 2 & 4 & -2 \\ \hline 1 & 2 & -1 & 4 & \end{array}} \quad \text{not a zero}$$

$$-2 \overline{) \begin{array}{ccc|c} 1 & 0 & -5 & -2 \\ & -2 & 4 & 2 \\ \hline 1 & -2 & -1 & 0 & \end{array}}$$

$$-\frac{1}{2} \overline{) \begin{array}{ccc|c} 2 & -1 & -9 & -4 \\ & -1 & 1 & 4 \\ \hline 2 & -2 & -8 & 0 & \end{array}}$$



$$-1 \overline{) \begin{array}{cccc|c} 1 & -2 & 1 & 12 & 8 \\ & & -1 & 3 & -4 & -8 \\ \hline 1 & -3 & 4 & 8 & 0 & \end{array}}$$

$$-1 \overline{) \begin{array}{ccc|c} 1 & -3 & 4 & 8 \\ & & -1 & 4 & -8 \\ \hline 1 & -4 & 8 & 0 & \end{array}}$$