

# Advanced Math

2-3

## Polynomial and Synthetic Division

Divide.

7)  $\frac{2x^2 + 10x + 12}{x + 3}$

$$= \frac{2(x^2 + 5x + 6)}{x + 3}$$

$$= \frac{2(x+2)(x+3)}{x+3}$$

$$= \boxed{2(x+2)}$$

17)  $\frac{x^4 + 3x^2 + 1}{x^2 - 2x + 3}$

$$\begin{array}{r} x^2 + 2x + 4 \\ x^2 - 2x + 3 \overline{) x^4 + 0x^3 + 3x^2 + 0x + 1} \\ \underline{-x^4 + 2x^3 - 3x^2} \phantom{+ 1} \\ 2x^3 + 0x^2 + 0x \phantom{+ 1} \\ \underline{-2x^3 + 4x^2 + 6x} \phantom{+ 1} \\ 4x^2 - 6x + 1 \\ \underline{-4x^2 + 8x - 12} \\ 2x - 11 \end{array}$$

$$\boxed{x^2 + 2x + 4 + \frac{2x - 11}{x^2 - 2x + 3}}$$

Divide.

29)  $\frac{5x^3 - 6x + 8}{x - 4}$

$$\begin{array}{r} 5 \quad 0 \quad -6 \quad 8 \\ 4 \overline{) 5 \quad 0 \quad -6 \quad 8} \\ \underline{20} \phantom{00} \phantom{00} \phantom{00} \\ 20 \phantom{00} \phantom{00} \phantom{00} \phantom{00} \\ \underline{74} \phantom{00} \phantom{00} \phantom{00} \\ 304 \end{array}$$

$$\boxed{5x^2 + 20x + 74 + \frac{304}{x-4}}$$

Remainder Theorem -

When dividing  $\frac{P(x)}{x-a}$ , the remainder will always equal  $P(a)$ .

Use synthetic division to find the function values.

49)  $f(x) = 4x^3 - 13x + 10$ ; find  $f(-2)$

$$f(-2) = 4(-2)^3 - 13(-2) + 10 = 4$$

$$\begin{array}{r} 4 \quad 0 \quad -13 \quad 10 \\ -2 \overline{) 4 \quad 0 \quad -13 \quad 10} \\ \underline{-8} \phantom{00} \phantom{00} \phantom{00} \\ 8 \phantom{00} \phantom{00} \phantom{00} \phantom{00} \\ \underline{-16} \phantom{00} \phantom{00} \phantom{00} \\ 4 \phantom{00} \phantom{00} \phantom{00} \phantom{00} \\ \underline{-8} \phantom{00} \phantom{00} \phantom{00} \\ 4 \end{array}$$

Factor Theorem -

When dividing  $\frac{P(x)}{x-a}$ , if the remainder is equal to zero, then  $x-a$  is a factor of  $P(x)$ , and  $\{a\}$  is a root of  $P(x)$ .

Use synthetic division to show that  $x$  is a solution of the polynomial, and use the result to factor the polynomial completely. List all the real zeros of the function.

61)  $x^3 - 3x^2 + 2 = 0$      $\{1 + \sqrt{3}, 1 - \sqrt{3}, 1\}$

$$(x - 1 - \sqrt{3})(x - 1 + \sqrt{3})(x - 1) = 0$$

$$x - (1 + \sqrt{3})$$

$$(1 + \sqrt{3})(-2 + \sqrt{3})$$

$$-2 + \sqrt{3} - 2\sqrt{3} + 3$$

$$1 - \sqrt{3}$$

$$\begin{array}{r} 1 \quad -3 \quad 0 \quad 2 \\ 1 \overline{) 1 \quad -3 \quad 0 \quad 2} \\ \underline{1} \phantom{00} \phantom{00} \phantom{00} \\ 0 \phantom{00} \phantom{00} \phantom{00} \phantom{00} \\ \underline{-3} \phantom{00} \phantom{00} \phantom{00} \\ 3 \phantom{00} \phantom{00} \phantom{00} \phantom{00} \\ \underline{-3} \phantom{00} \phantom{00} \phantom{00} \\ 0 \phantom{00} \phantom{00} \phantom{00} \phantom{00} \\ \underline{2} \phantom{00} \phantom{00} \phantom{00} \\ 0 \end{array}$$

$$x - 1 = 0$$

Assignment:

- pg. 239
- 8 - 20 even,
- 24 - 40 even,
- 56 - 62 even,
- 68 - 72 even,
- 73, 74