

$$y_1 = \frac{x^3 - 3x^2 + 4x - 1}{x+3}$$

$$y_2 = x^2 - 6x + 22 - \frac{67}{x+3}$$

$$\begin{array}{r} x^2 - 6x + 22 \\ \hline x+3) x^3 - 3x^2 + 4x - 1 \\ - x^3 + 3x^2 \\ \hline - 6x^2 + 4x \\ + 6x^2 + 18x \\ \hline - 22x - 1 \\ - 22x + 66 \\ \hline - 67 \end{array}$$

$$48) \quad k = 1/5$$

$$(5x-1)(2x^2 - 4x - 7)/5 + \frac{13/5}{5x-1}$$

$$f(x) = 10x^3 - 22x^2 - 3x + 4$$

$$f(1/5) = 10(1/5)^3 - 22(1/5)^2 - 3(1/5) + 4$$

$$f(1/5) = 13/5$$

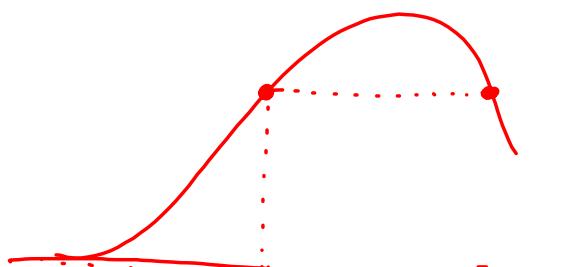
$$\begin{array}{r} 2x^2 - 4x - 7/5 + \frac{13/5}{5x-1} \\ \hline 5x-1) 10x^3 - 22x^2 - 3x + 4 \\ - 10x^3 + 2x^2 \\ \hline - 20x^2 - 3x \\ + 20x^2 + 4x \\ \hline - 7x + 4 \\ + 7x + 7/5 \\ \hline 13/5 \end{array}$$

$$4 + (-7/5)$$

10)

$$\begin{array}{r} X^2 + 0x + 1 \\ \overline{) X^4 + 0x^3 + X^2 + 0x - 1} \\ - X^4 + 0x^3 + X^2 \\ \hline 0 \quad 0 \quad 0 \quad + 0x - 1 \end{array}$$

$$y = X^2 - \frac{1}{X^2 + 1}$$



$$X = 20$$

2.3B

Synthetic Division

For long division of polynomials by divisors in the form $x - k$, synthetic division can be used.

$$f(x) = x^4 - 10x^2 - 2x + 4$$

$$d(x) = x + 3$$

$$\begin{array}{r}
 \underline{-3} | \quad 1 \quad 0 \quad -10 \quad -2 \quad 4 \\
 \quad \quad \downarrow \quad -3 \quad 9 \quad 3 \quad -3 \\
 \hline
 \quad \quad 1 \quad -3 \quad -1 \quad 1 \quad : \text{remainder}
 \end{array}$$

Quotient

$$x^3 - 3x^2 - x + 1 + \frac{1}{x+3} \quad x \neq -3$$

$x+3=0$
 $x=-3$

Use synthetic division:

$$f(x) = 5x^3 + 8x^2 - x + 6$$

$$d(x) = x + 2$$

The remainder theorem:

If a polynomial $f(x)$ is divided by $x - k$, then the remainder is $r = f(k)$.

Use the remainder theorem to find each function value given:

$$f(x) = 4x^3 + 10x^2 - 3x + 8$$

Divisor $(x+1)$

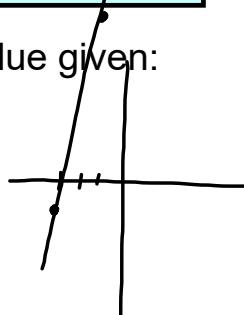
a) $f(-1) = 17$

b) $f(4) = 412$

c) $f(1/2) = 9.5$

d) $f(-3) = -1$

$$\begin{aligned} f(-3) &= -1 \\ f(-1) &= 17 \\ f(1/2) &= 9.5 \\ f(4) &= 412 \end{aligned}$$



Show that $(x - 2)$ and $(x + 3)$ are factors of:

$f(x) = 2x^4 + 7x^3 - 4x^2 - 27x - 18$, then find the remaining zeros.

$$\begin{array}{r} \underline{2} \quad 2 \quad 7 \quad -4 \quad -27 \quad -18 \\ \downarrow \quad 4 \quad 22 \quad 36 \quad 18 \\ \hline -3 \quad 2 \quad 11 \quad 18 \quad 9 \quad \dots \quad 0 \\ \downarrow \quad -6 \quad -15 \quad -9 \\ \hline 2 \quad 5 \quad 3 \quad \vdots \quad 0 \end{array} \quad X = 2, -3, -\frac{3}{2}, -1$$

Pull

$$\begin{aligned} 2x^2 + 5x + 3 &= 0 \\ (2x + 3)(x + 1) &= 0 \end{aligned}$$

Show that $(x + 3)$ is a factors of:

$f(x) = x^3 - 19x - 30$, then find the remaining zeros.

$$\begin{array}{r}
 \begin{array}{rrrrr}
 -3 & | & 1 & 0 & -19 & -30 \\
 & \downarrow & -3 & 9 & 30 \\
 & \hline
 & 1 & -3 & -10 & 0
 \end{array} \\
 x^3 - 3x - 10 = 0 \\
 (x - 5)(x + 2) = 0
 \end{array}$$

Long Division or Synthetic Division?

$$f(x) = 6x^3 - 16x^2 + 17x - 6 \quad d(x) = 3x - 2$$

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$$\begin{array}{r|rrrr} \frac{2}{3} & 6 & -16 & 17 & -6 \\ \hline & \downarrow & 4 & -8 & 6 \\ \hline & 6 & -12 & 9 & 0 \\ \hline & 6x^2 - 12x + 9 & & & \end{array}$$

$$(3x-2)(6x^2-12x+9)=0$$

$$(3x-2)(2x^2-4x+3)=0 \quad x \neq \frac{2}{3}$$

Long Division or Synthetic Division?

$$f(x) = 4x^3 - 7x^2 - 11x + 5$$

$$d(x) = 4x + 5$$

$$\begin{array}{r} \frac{-5}{4} | 4 \quad -7 \quad -11 \quad 5 \\ \downarrow \quad \quad -5 \quad +15 \quad -5 \\ \hline 4 \quad -12 \quad 4 \quad 0 \end{array}$$

$$(4x+5)(x^2 - 3x + 1) = 0 \quad x \neq -5/4$$

Section 2.3 B

Pg. 142-144: #25-43 odd, 46, 51, 55, 57, 58, 63, 65, 71, 78, 82

