Section 5.2: Synthetic division

#1- 10:

a) Perform the division using synthetic division.

b) if the remainder is 0 use the result to completely factor (the dividend is the numerator or the polynomial to the left of the division sign.)

1) $\frac{3x^3-17x^2+15x-25}{x-5}$

1a)

$$\begin{array}{r|rrrr} 5 & 3 & -17 & 15 & -25 \\ & \downarrow & 15 & -10 & 25 \\ \hline & 3 & -2 & 5 & 0 \end{array}$$

$$\boxed{\frac{3x^3-17x^2+15x-25}{x-5} = 3x^2-2x+5 \quad (R=0)}$$

1b) $3x^3-17x^2+15x-25 = (x-5)(3x^2-2x+5)$

$(3x^2-2x+5$ is prime$)$

#1- 10:

a) Perform the division using synthetic division.

b) if the remainder is 0 use the result to completely factor the dividend (the dividend is the numerator or the polynomial to the left of the division sign.)

3) $\frac{4x^3+8x^2-9x-18}{x+2}$

3a)

$$\begin{array}{r|rrrr} -2 & 4 & 8 & -9 & -18 \\ & & -8 & 0 & 18 \\ \hline & 4 & 0 & -9 & 0 \end{array}$$

$$\boxed{\frac{4x^3+8x^2-9x-18}{x+2} = 4x^2-9 \quad (R=0)}$$

3b) $4x^3+8x^2-9x-18 = (x+2)(4x^2-9)$

$$\boxed{= (x+2)(2x+3)(2x-3)}$$

#1- 10:

a) Perform the division using synthetic division.

b) if the remainder is 0 use the result to completely factor the dividend (the dividend is the numerator or the polynomial to the left of the division sign.)

5) $\frac{3x^3-16x^2-72}{x-6}$

box

5a)

$$\begin{array}{c|cccc} 6 & 3 & -16 & 0 & -72 \\ & & 18 & 12 & 72 \\ \hline & 3 & 2 & 12 & 0 \end{array}$$

$$\boxed{\frac{3x^3-16x^2-72}{x-6} = 3x^2+2x+12 \quad (R=0)}$$

5b) $\boxed{3x^3-16x^2-72=(x-6)(3x^2+2x+12)}$

This is PRime

#1- 10:

a) Perform the division using synthetic division.

b) if the remainder is 0 use the result to completely factor the dividend (the dividend is the numerator or the polynomial to the left of the division sign.)

7) $(5x^3 + 6x + 8) \div (x + 2)$

$0x^2$

7a)

$$\begin{array}{r|rrrr} -2 & 5 & 0 & 6 & 8 \\ & & -10 & 20 & -52 \\ \hline & 5 & -10 & 26 & -44 \end{array}$$

$$\frac{5x^3 + 6x + 8}{x+2} = 5x^2 - 10x + 26 \quad R = -44$$

OR $5x^2 - 10x + 26 - \dfrac{44}{x+2}$

7b) Skip part b

Since Remainder not 0

#1- 10:

a) Perform the division using synthetic division.

b) if the remainder is 0 use the result to completely factor the dividend (the dividend is the numerator or the polynomial to the left of the division sign.)

9) $(x^3 - 27) \div (x - 3)$

9a

$$\begin{array}{r|rrrr} 3 & 1 & 0 & 0 & -27 \\ & \downarrow & 3 & 9 & 27 \\ \hline & 1 & 3 & 9 & 0 \end{array}$$

$(x^3-27) \div (x-3) = x^2+3x+9$

9b) $x^3-27 = (x-3)(x^2+3x+9)$

Prime

#11 – 20:

a) use your graphing calculator, or the rational root theorem to find a x-intercept of the polynomial

b) use synthetic division to completely factor the polynomial

c) Use your answer to part a to solve f(x) = 0

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

11a) $\boxed{x = -3 \text{ or } 2 \text{ or } -1}$

11b)

$$\begin{array}{r|rrrr} -3 & 1 & 2 & -5 & -6 \\ & & -3 & 3 & 6 \\ \hline & 1 & -1 & -2 & 0 \end{array}$$

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

$\boxed{= (x+3)(x+1)(x-2)}$

11c) $f(x) = 0$

$(x+3)(x+1)(x-2) = 0$

$x+3=0 \quad x+1=0 \quad x-2=0$

$x=-3 \quad x=-1 \quad x=2$

$\boxed{x = -3, -1, 2}$

#11 – 20:

a) use your graphing calculator, or the rational root theorem to find a x-intercept of the polynomial

b) use synthetic division to completely factor the polynomial

c) Use your answer to part a to solve f(x) = 0

13) $f(x) = 2x^3 - 13x^2 + 24x - 9$

13a) $x = 3$

13b)

$$\begin{array}{r|rrrr} 3 & 2 & -13 & 24 & -9 \\ & & 6 & -21 & 9 \\ \hline & 2 & -7 & 3 & 0 \end{array}$$

$$2x^3 - 13x^2 + 24x - 9 = (x-3)(2x^2 - 7x + 3)$$

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

$$= \boxed{(x-3)^2(2x-1)}$$

factor $2x^2 - 7x + 3$

$= (2x^2 - 6x)(-1x + 3)$

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

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

13c) $f(x) = 0$

$(x-3)^2(2x-1) = 0$

$(x-3)(x-3)(2x-1) = 0$

$x - 3 = 0$ $\quad$ $x - 3 = 0$ $\quad$ $2x - 1 = 0$

$x = 3$ $\quad$ $x = 3$ $\quad$ $2x = 1$

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

$\boxed{x = 3, \frac{1}{2}}$

#11 – 20:

a) use your graphing calculator, or the rational root theorem to find a x-intercept of the polynomial

b) use synthetic division to completely factor the polynomial

c) Use your answer to part a to solve f(x) = 0

15) $f(x) = 6x^3 - 29x^2 - 62x + 120$

15a) $x = 6$

15b)

$$\begin{array}{c|cccc} 6 & 6 & -29 & -62 & 120 \\ & & 36 & 42 & -120 \\ \hline & 6 & 7 & -20 & 0 \end{array}$$

$6x^3 - 29x^2 - 62x + 120 = (x-6)(6x^2+7x-20)$

$\boxed{= (x-6)(3x-4)(2x+5)}$

factor $6x^2+7x-20$

$= (6x^2 - 8x) + (15x - 20)$

$= 2x(3x-4) + 3(3x-4)$

$= (3x-4)(2x+3$

15c) $f(x) = 0$

$(x-6)(3x-4)(2x+5) = 0$

$x - 6 = 0$ $\quad$ $3x - 4 = 0$ $\quad$ $2x + 5 = 0$

$x = 6$ $\quad$ $3x = 4$ $\quad$ $2x = -5$

$x = \frac{4}{3}$ $\quad$ $x = \frac{-5}{2}$

$x = 6, \frac{4}{3}, \frac{-5}{2}$

#11 – 20:

a) use your graphing calculator, or the rational root theorem to find a x-intercept of the polynomial

b) use synthetic division to completely factor the polynomial

c) Use your answer to part a to solve f(x) = 0

17) $f(x) = x^3 - 3x^2 + 4x - 12$

17a) $x = 3$

17b)
$$\begin{array}{r|rrrr} 3 & 1 & -3 & 4 & -12 \\ & & 3 & 0 & 12 \\ \hline & 1 & 0 & 4 & 0 \end{array}$$

$$x^3 - 3x^2 + 4x - 12 = (x-3)(x^2+4)$$

Prime

17c) $(x-3)(x^2+4) = 0$

$x - 3 = 0$

$x = 3$

$x^2 + 4 = 0$

$x^2 = -4$

$x = \pm 2i$

$$\boxed{x = 3, \pm 2i}$$

#11 – 20:

a) use your graphing calculator, or the rational root theorem to find a x-intercept of the polynomial

b) use synthetic division to completely factor the polynomial

c) Use your answer to part a to solve f(x) = 0

19) $f(x) = x^3 + 4x^2 + 25x + 100$

19a) $x = -4$

19b)

$$\begin{array}{r|rrrr} -4 & 1 & 4 & 25 & 100 \\ & & -4 & 0 & -100 \\ \hline & 1 & 0 & 25 & 0 \end{array}$$

$x^3 + 4x^2 + 25x + 100 = (x+4)(x^2+25)$

Prime

19c) $f(x) = 0$

$(x+4)(x^2+25) = 0$

$x+4=0 \qquad x^2+25=0$

$x=-4 \qquad \sqrt{x^2} = \pm\sqrt{-25}$

$x = \pm 5i$

$$\boxed{x = -4, \pm 5i}$$