Review:

1. Solve the system of equations

$$\begin{cases} 3x - 6y = 6 \\ (9x - 3y = 8)(-2) \end{cases}$$

$3x - 6y = 6$

$-18x + 6y = -16$

$-15x = -10$

$x = \dfrac{-10}{-15} = \dfrac{2}{3}$

$3\left(\dfrac{2}{3}\right) - 6y = 6$

$2 - 6y = 6$

$-6y = 4$

$y = \dfrac{4}{-6} = -\dfrac{2}{3}$

$$\left(\dfrac{2}{3}, -\dfrac{2}{3}\right)$$

2. Evaluate $f(-2)$ when $f(x) = -3x^2 - 2x + 5$

$f(-2) = -3(-2)^2 - 2(-2) + 5$

$= -3(4) + 4 + 5$

$= -12 + 9 = \boxed{-3}$

20. $\dfrac{x + 3x^4 - x^2 + 5x^3 - 2}{x + 2}$

$$\begin{array}{r} 3x^3 - x^2 + x - 1 \\ x+2 \overline{\smash)3x^4 + 5x^3 - x^2 + x - 2} \\ \underline{-(3x^4 + 6x^3)} \\ -x^3 - x^2 + x - 2 \\ \underline{-(-x^3 - 2x^2)} \\ x^2 + x - 2 \\ \underline{-(x^2 + 2x)} \\ -x - 2 \\ \underline{-(-x - 2)} \\ 0 \end{array}$$

$-1 + (+2)$

$= 1$

24. $\dfrac{2 - 3x^2 + 5x^3}{x^2 + 3}$

$$\begin{array}{r} 5x - 3 \\ x^2+3 \overline{\smash)5x^3 - 3x^2 + 2} \\ \underline{-(5x^3 + 15x)} \\ -3x^2 - 15x + 2 \\ \underline{-(-3x^2 - 9)} \\ -15x + 11 \end{array}$$

Quotient:
5x - 3
Remainder:
-15x + 11

42. $(x^3 + 2x + 5) \div (x - 2)$

$1 \cdot x^3 + 0 \cdot x^2 + 2x + 5$

$$
\begin{array}{r|rrrr}
2 & 1 & 0 & 2 & 5 \\
  &   & 2 & 4 & 12 \\
\hline
  & 1 & 2 & 6 & \boxed{17}
\end{array}
$$

Quotient:
$x^2 + 2x + 6$
Remainder:
17

48. $\dfrac{3 - 13x - 5x^2 + 9x^3 - 2x^4}{3 - x}$

$-2x^4 + 9x^3 - 5x^2 - 13x + 3$

$$
\begin{array}{r|rrrrr}
3 & -2 & 9 & -5 & -13 & 3 \\
  &   & -6 & 9 & 12 & -3 \\
\hline
  & -2 & 3 & 4 & -1 & \boxed{0}
\end{array}
$$

Quotient: $-2x^3 + 3x^2 + 4x - 1$
Remainder: 0

52. $\dfrac{x^4 - 3x^3 - 30}{x + 2}$

$$
\begin{array}{r}
x^3 - 5x^2 + 10x - 20 \\
x+2 \overline{)\, x^4 - 3x^3 - 30} \\
\underline{-(x^4 + 2x^3)} \\
-5x^3 - 30 \\
\underline{-(-5x^3 - 10x^2)} \\
10x^2 - 30 \\
\underline{-(10x^2 + 20x)} \\
-20x - 30 \\
\underline{-(-20x - 40)} \\
10
\end{array}
$$

$$
\begin{array}{r|rrrrr}
-2 & 1 & -3 & 0 & 0 & -30 \\
   &   & -2 & 10 & -20 & 40 \\
\hline
   & 1 & -5 & 10 & -20 & \boxed{10}
\end{array}
$$

Quotient:
$x^3 - 5x^2 + 10x - 20$
Remainder:
10

2

Evaluate a Polynomial using Synthetic Division

Remainder Theorem: If the polynomial $P(x)$ is divided by $x - a$, the remainder is $P(a)$.

56. $Q(x) = 3x^2 - 5x - 1$; $Q(2) = \boxed{1}$

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

60. $R(t) = 3t^3 + t^2 - 4t + 2$; $R(-3) = \boxed{-58}$

$$
\begin{array}{r|rrrr}
-3 & 3 & 1 & -4 & 2 \\
   &   & -9 & 24 & -60 \\
\hline
   & 3 & -8 & 20 & \boxed{-58}
\end{array}
$$

64. $Q(x) = x^4 - 2x^3 + 4x - 2$; $Q(-2) = \boxed{22}$

$$
\begin{array}{r|rrrrr}
-2 & 1 & -2 & 0   & 4   & -2 \\
   &   & -2 & 8   & -16 & 24 \\
\hline
   & 1 & -4 & 8   & -12 & \boxed{22}
\end{array}
$$

$$
\begin{array}{r}
^1 132 \\
4 \\
\hline
528
\end{array}
$$

$$
\begin{array}{r}
^1 66 \\
66 \\
\hline
132
\end{array}
$$

68. $P(z) = 2z^4 + z^2 - 3$; $P(-4) = \boxed{525}$

$$
\begin{array}{r|rrrrr}
-4 & 2 & 0 & 1   & 0   & -3 \\
   &   & -8 & 32 & -132 & 528 \\
\hline
   & 2 & -8 & 33 & -132 & 525
\end{array}
$$

5.5 – factoring a polynomial

GCF – Greatest Common Factor

$$ab + ac = a(b+c)$$

$$12 = 1 \cdot 12 = 2 \cdot 6 = 3 \cdot 4 = 2 \cdot 2 \cdot 3$$

$$x^3 = x \cdot x^2 = x^2 \cdot x = x \cdot x \cdot x = 1 \cdot x^3$$

$$x^2 y^3 = 1 \cdot x^2 y^3 = x \cdot x \cdot y \cdot y \cdot y = x \cdot x \cdot y^3 = x \cdot x \cdot y \cdot y^2 =$$

$$xy^2 \cdot xy$$

$$12x^3 y^4 \quad \& \quad 8x^2 y^5$$

$$4 \cdot 3 \quad x^2 \cdot x \qquad 4 \cdot 2 \quad y^4 \cdot y$$

GCF: $4x^2 y^4$

---

1. $15x^2 y z^3$, $9x^3 y^2 z$, $75x^4 y^2 z^2$

GCF: $3x^2 y z$

2. $-16x^3 y^5 z^6$, $24x^4 y^{10} z^3$, $40x^2 y^2 z^9$

GCF: $8x^2 y^2 z^3$

5.5

14. $x^2y^4 - x^2y - 4x^2$

$x^2(y^4 - y - 4)$

20. $b^{n+5} - b^5$

$b^5(b^n - 1)$

22. $14a^4b^4 - 42a^3b^3 + 28a^3b^2$

$14a^3b^2(ab^2 - 3b + 2)$

24. $10x^2y + 20x^2y^2 + 30x^2y^3$

$10x^2y(1 + 2y + 3y^2)$

Factor trinomials of the form
$$x^2 + bx + c = (x+d)(x+e)$$

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

factors of 6 (constant term) that sum to give you 5 (x-coeff.)

$$x^2 - 7x + 6 = (x-1)(x-6)$$

54. $a^2 + a - 72 = (a+9)(a-8)$

64. $b^2 - 6b - 16 = (b-8)(b+2)$

72. $y^2 - 13y + 12$

$(y - 1)(y - 12)$

74. $x^2 + 7x - 18$

$(x + 9)(x - 2)$

Factoring by Grouping

28. $3(x+y) + a(x+y)$

$(x+y)(3 + a)$

30. $3(a-7) - b(7-a)$

$-b[-1(-7+a)]$

$3(a-7) + b(a-7)$

$(a-7)(3+b)$

32. $x^2 - 5x + 4x - 20$

34. $ab + 7b - 3a - 21$

38. $a^2 b + 3a^2 + 2b + 6$

Factor trinomials of the form
$$ax^2 + bx + c$$

Textbook Homework Problems:

5.4 #19-25 odd; 27-43 odd; 55-61 odd

5.5

#21-47

odd