

Math 135 – Intermediate Algebra

Homework 5 – Solutions

November 7, 2007

5.1: Problems 9-25, 33-55, 61-73

9. terms: $5x^3$, $-x^2$, $-6x$, 7; coefficients: 5, -1, -6, 7

11. terms: $4n$, $-\frac{n^2}{3}$; coefficients: 4, $\frac{1}{3}$

13. terms: $3a^2$, $-8ab$, $5b^2$; coefficients: 3, -8, 5

15. Polynomial of degree 3

17. Binomial of degree 2

19. Trinomial of degree 4

21. Monomial of degree 5

23. $-3x^2 + 9x + 2$; leading term: $-3x^2$

25. $5x^5 + 8x^4 - 2x^3 - x + 10$; leading term: $5x^5$

33. $-2x^2 + 10x - 9$

35. $3n^3 + n^2 + 2n$

37. $-6x^4 - \frac{1}{6}x^2 + \frac{9}{8}$

39. $2x^2 - 7x + 6$

a.

$$\begin{aligned} 2(2)^2 - 7(2) + 6 &= \\ 8 - 14 + 6 &= 0 \end{aligned}$$

b.

$$\begin{aligned} 2(-3)^2 - 7(-3) + 6 &= \\ 18 + 21 + 6 &= 45 \end{aligned}$$

41. $8x^3 - 4x^2 - 2x + 7$

a.

$$\begin{aligned} 8\left(\frac{3}{2}\right)^3 - 4\left(\frac{3}{2}\right)^2 - 2\left(\frac{3}{2}\right) + 7 &= \\ 8\left(\frac{27}{8}\right) - 4\left(\frac{9}{4}\right) - 2\left(\frac{3}{2}\right) + 7 &= \\ 27 - 9 - 3 + 7 &= 22 \end{aligned}$$

b.

$$\begin{aligned} 8\left(-\frac{1}{2}\right)^3 - 4\left(-\frac{1}{2}\right)^2 - 2\left(-\frac{1}{2}\right) + 7 &= \\ 8\left(-\frac{1}{8}\right) - 4\left(-\frac{1}{4}\right) - 2\left(-\frac{1}{2}\right) + 7 &= \\ -1 - 1 + 1 + 7 &= 6 \end{aligned}$$

43.

$$\begin{aligned} 3x + 9 + 2x^2 - 4x + 1 &= \\ 2x^2 + (3x - 4x) + (1 + 9) &= \\ 2x^2 - x + 10 & \end{aligned}$$

45.

$$\begin{aligned} (a^3 - 5a^3 + 3) - (5a^2 + a - 3) &= \\ a^3 - 5a^3 + 3 - 5a^2 - a + 3 &= \\ a^3 + (-5a^3 - 5a^2) - a + (3 + 3) &= \\ a^3 - 10a^2 - a + 6 & \end{aligned}$$

47.

$$\begin{aligned} (3x^4 - 7x^3 + x^2 + 8x - 10) + (8x^3 - 1) + \\ (10 - 9x - 7x^2 + x^4) &= \\ (3x^4 + x^4) + (-7x^3 + 8x^3) + (x^2 - 7x^2) + \\ (8x - 9x) + (-10 - 1 + 10) &= \\ 4x^4 + x^3 - 6x^2 - x - 1 & \end{aligned}$$

49.

$$\begin{aligned} (12p^5 - 2p^3 + 4p^2 - 11p) - \\ (13p^5 + p^4 + 2p^3 - 3p^2 - 11p - 1) &= \\ (12p^5 - 13p^5) - p^4 + (-2p^3 - 2p^3) + \\ (4p^2 + 3p^2) + (-11p + 11p) + 1 &= \\ -p^5 - p^4 - 4p^3 + 7p^2 + 1 & \end{aligned}$$

51.

$$\begin{aligned} (x^2 + 5xy + 6y^2) + (9x^2y - 2xy^2 - 3xy + x^2 - y^2) + \\ (2x^2y - 12xy^2) &= \\ (9x^2y + 2x^2y) + (-2xy^2 - 12xy^2) + (x^2 + x^2) + \\ (5xy - 3xy) + (6y^2 - y^2) &= \\ 11x^2y - 14xy^2 + 2x^2 + 2xy + 5y^2 & \end{aligned}$$

53.

$$\begin{array}{rrrr} -y^3 & -3y^2 & +4y & \\ + & 6y^3 & +8y^2 & -3y & +2 \\ \hline +5y^3 & +5y^2 & +y & +2 \end{array}$$

55.

$$\begin{array}{rrrr} 3p^4 & -2p^2 & & -5 \\ - & +p^2 & -10p & +21 \\ \hline 3p^4 & -3p^2 & +10p & -26 \end{array}$$

61.

$$\begin{aligned} (3x^2 - 7x + 5) - (5x - 8x^2) + (2 + 6x - 9x^2) = \\ (3x^2 + 8x^2 - 9x^2) + (-7x - 5x + 6x) + (5 + 2) = \\ 2x^2 - 6x + 7 \end{aligned}$$

63.

$$\begin{aligned} (12n^3 + 16) - (11n^3 - 9n^2 + 3n + 8) - (-10n - 13) = \\ (12n^3 - 11n^3) + 9n^2 + (-3n + 10n) + (16 + 13 - 8) = \\ n^3 + 9n^2 + 7n + 21 \end{aligned}$$

65.

$$\begin{aligned} f(x) + g(x) = \\ (2x^2 - 8) + (2x^2 + 7x + 5) = \\ (2x^2 + 2x^2) + 7x + (-8 + 5) = \\ 4x^2 + 7x - 3 \end{aligned}$$

$$\begin{aligned} f(x) - g(x) = \\ (2x^2 - 8) - (2x^2 + 7x + 5) = \\ (2x^2 - 2x^2) - 7x + (-8 - 5) = \\ -7x - 13 \end{aligned}$$

67.

$$\begin{aligned} f(x) + g(x) = \\ (-5x^4 + 6x^2 - 3) + (4x^4 - 3x^3 + 2x^2 - x) = \\ (-5x^4 + 4x^4) - 3x^3 + (6x^2 + 2x^2) - x - 3 = \\ -x^4 - 3x^3 + 8x^2 - x - 3 \end{aligned}$$

$$\begin{aligned} f(x) - g(x) = \\ (-5x^4 + 6x^2 - 3) - (4x^4 - 3x^3 + 2x^2 - x) = \\ (-5x^4 - 4x^4) + 3x^3 + (6x^2 - 2x^2) - x - 3 = \\ -9x^4 + 3x^3 + 4x^2 + x - 3 \end{aligned}$$

69.

$$\begin{array}{l} t \quad h(t) = -16t^2 + 520 \\ \hline 0: \quad -16 \cdot 0^2 + 520 = 520 \\ 1: \quad -16 \cdot 1^2 + 520 = 504 \\ 2: \quad -16 \cdot 2^2 + 520 = 456 \\ 3: \quad -16 \cdot 3^2 + 520 = 376 \end{array}$$

71.

$$\begin{aligned} R(n) &= 18n + 3.5n^2 - 0.005n^3 \\ R(100) &= 18 \cdot 100 + 3.5 \cdot 100^2 - 0.005 \cdot 100^3 \\ &= 1800 + 35000 - 5000 \\ &= 31800 \end{aligned}$$

73.

$$\begin{aligned} (8t^4 - 82t^3 + 245t^2 - 303t + 38,387) + (25t^2 + 93t + 14,783) = \\ 8t^4 - 82t^3 + (245t^2 + 25t^2) + (-303t + 93t) + (38,387 + 14,783) = \\ 8t^4 - 82t^3 + 270t^2 - 210t + 53,170 \end{aligned}$$

5.2: Problems 1-19, 29-49, 67-77, 101, 103, 109-115

1.

$$(6n^3)(-5n^3) = (-5 \cdot 6)(n^3 \cdot n^3) = -30n^6$$

3.

$$(-\frac{2}{3}rt^2)(-9r^3t) = (-\frac{2}{3} \cdot -9)(r \cdot r^3)(t^2 \cdot t) = 6r^4t^3$$

5.

$$(10x^5)(-x^3)(-2x^4) = (10 \cdot -1 \cdot -2)(x^5 \cdot x^3 \cdot x^4) = 20x^{12}$$

7.

$$(-3pr) \cdot 2p^3q \cdot q^2 = (-3 \cdot 2)(p \cdot p^3)(q \cdot q^2)r = -6p^4q^3r$$

9.

$$(-4ab^5)^3 = (-4ab^5)(-4ab^5)(-4ab^5) = -64a^3b^{15}$$

11.

$$(-2x)(5) + (-2x)(-4x) = -10x + 8x^2$$

13.

$$(4n^2)(6n) + (4n^2)(-1) = 24n^3 - 4n^2$$

15.

$$(-3x)(x^2) + (-3x)(-4x) + (-3x)(5) = -3x^3 + 12x^2 - 15x$$

17.

$$(\frac{1}{2}n^3)(12m^2) + (\frac{1}{2}n^3)(8n) = 6n^3m^2 + 4n^4$$

19.

$$\begin{aligned} (7x^5)(4x^2y^4) + (-4x^3)(4x^2y^4) + (1)(4x^2y^4) = \\ 28x^7y^4 - 16x^5y^4 + 4x^2y^4 \end{aligned}$$

29.

$$\begin{aligned} (x+2)(x+4) = \\ x^2 + 4x + 2x + 8 = \\ x^2 + 6x + 8 \end{aligned}$$

31.

$$\begin{aligned}(n-6)(n-3) &= \\ n^2 - 3n - 6n + 18 &= \\ n^2 - 9n + 18 &\end{aligned}$$

33.

$$\begin{aligned}(5-a)(a+7) &= \\ 5a + 35 - a^2 - 7a &= \\ -a^2 - 2a + 35 &\end{aligned}$$

35.

$$\begin{aligned}(y+7)^2 &= \\ (y+7)(y+7) &= \\ y^2 + 7y + 7y + 49 &= \\ y^2 + 14y + 49 &\end{aligned}$$

37.

$$\begin{aligned}(2x-1)(x+4) &= \\ 2x^2 + 8x - x - 4 &= \\ 2x^2 + 7x - 4 &\end{aligned}$$

39.

$$\begin{aligned}(3-2x)(2+3x) &= \\ 6 + 9x - 4x - 6x^2 &= \\ -6x^2 + 5x + 6 &\end{aligned}$$

41.

$$\begin{aligned}(5x+3)(6x+5) &= \\ 30x^2 + 25x + 18x + 15 &= \\ 30x^2 + 43x + 15 &\end{aligned}$$

43.

$$\begin{aligned}(4x-9)^2 &= \\ (4x-9)(4x-9) &= \\ 16x^2 - 36x - 36x + 81 &= \\ 16x^2 - 72x + 81 &\end{aligned}$$

45.

$$\begin{aligned}(a-b)(2a+3b) &= \\ 2a^2 + 3ab - 2ab - 3b^2 &= \\ 2a^2 + ab - 3b^2 &\end{aligned}$$

47.

$$\begin{aligned}(9p+10q)(2p-q) &= \\ 18p^2 - 9pq + 20pq - 10q^2 &= \\ 18p^2 + 11pq - 10q^2 &\end{aligned}$$

49.

$$\begin{aligned}(7x-11y)(8x-7y) &= \\ 56x^2 - 49xy - 88xy + 77y^2 &= \\ 56x^2 - 137xy + 77y^2 &\end{aligned}$$

67. $t^2 - 100$ 69. $x^2 + 16x + 64$ 71. $16n^2 - 9$ 73. $4n^2 - 20n + 25$ 75. $b^2 - \frac{2}{3}ab + \frac{1}{9}a^2$ 77. $25x^2 - y^2$

101.

$$\begin{aligned}(3x^2-1)(5x+2) &= \\ 15x^3 + 6x^2 - 5x - 2 &\end{aligned}$$

103.

	x^2	$+7x$	-3
	x^2	$-6x$	
	$-6x^3$	$-42x^2$	$18x$
x^4	$7x^3$	$-3x^2$	
x^4	$+x^3$	$-45x^2$	$+18x$

109. $pV_2 - pV_1$

111.

a.

$$\begin{aligned}(6+x)(12+x) &= \\ 72 + 6x + 12x + x^2 &= \\ x^2 + 18x + 72 &\end{aligned}$$

b.

$$\begin{aligned}(x^2 + 18x + 72) - 72 &= \\ x^2 + 18x &\end{aligned}$$

113.

a. Longest panel: $(x + 0.1)$ inches by $(x + 0.1)$ inches.
Shortest panel: $(x - 0.1)$ inches by $(x - 0.1)$ inches.

b.

$$\begin{aligned}(x + 0.1)^2 - (x - 0.1)^2 &= \\(x^2 + 0.2x + 0.01) - (x^2 - 0.2x + 0.01) &= \\0.4x &= \end{aligned}$$

115.

$$\begin{aligned}\text{Volume} &= \text{length} \cdot \text{width} \cdot \text{height} = \\(18 - 2x) \cdot (12 - 2x) \cdot x &= \\(216 - 36x - 24x + 4x^2) \cdot x &= \\216x - 60x^2 + 4x^3 &= \end{aligned}$$

5.3: Problems 1-15, 21-27, 39, 51, 53

1.

$$\frac{6x^4}{2x^3} = \frac{6}{2} \cdot \frac{x^4}{x^3} = 3x^{4-3} = 3x$$

3.

$$\frac{20y^5}{-4y^3} = \frac{20}{-4} \cdot \frac{y^5}{y^3} = -5y^{5-3} = -5y^2$$

5.

$$\frac{-9x^5y^2}{-3xy} = \frac{-9}{-3} \cdot \frac{x^5}{x} \cdot \frac{y^2}{y} = 3x^{5-1}y^{2-1} = 3x^4y$$

7.

$$\frac{6x^3 + 9x^2}{3x} = \frac{6x^3}{3x} + \frac{9x^2}{3x} = 2x^2 + 3x$$

9.

$$\frac{24n^3 - 10n^2 + 4n}{-4} = \frac{24n^3}{-4} + \frac{-10n^2}{-4} + \frac{4n}{-4} = -6n^3 + \frac{5}{2}n^2 - n$$

11.

$$\frac{54a^5 - 6a^4 + 36a^3}{6a^3} = \frac{54a^5}{6a^3} + \frac{-6a^4}{6a^3} + \frac{36a^3}{6a^3} = 9a^2 - a + 6$$

13.

$$\begin{aligned}\frac{16t^4 + 10t^3 - 18t^2 - 8t}{-2t^2} &= \frac{16t^4}{-2t^2} + \frac{10t^3}{-2t^2} + \frac{-18t^2}{-2t^2} + \frac{-8t}{-2t^2} = \\&= -8t^2 - 5t + 9 + \frac{4}{t}\end{aligned}$$

15.

$$\begin{aligned}\frac{8p^2 - 16pq + 28q^2}{4q^2} &= \frac{8p^2}{4q^2} + \frac{-16pq}{4q^2} + \frac{28q^2}{4q^2} = \\&= \frac{2p^2}{q^2} - \frac{4p}{q} + 7\end{aligned}$$

21. see attached

23. see attached

25. see attached

27. see attached

39. see attached

51.

a.

$$\frac{7.95 + 0.05x}{x} = \frac{7.95}{x} + 0.05$$

b. x is the number of monthly minutes, and 5 hours of calls is equal to $5 \cdot 60 = 300$ minutes, so $x = 300$.

$$\frac{7.95}{300} + 0.05 \approx 0.08 = 8 \text{ cents}$$

53.

a. see attached

b. see attached

$$\begin{array}{r}
 \overline{x-2} \\
 21) \quad x-2 \overline{) x^2 - 4x + 4} \\
 \underline{- x^2 - 2x} \\
 -2x + 4 \\
 \underline{-2x + 4} \\
 0
 \end{array}$$

$$\boxed{\text{Answer: } x-2}$$

$$\begin{array}{r}
 \overline{n^2 + 4n - 5} \\
 23) \quad n+1 \overline{) n^3 + 5n^2 - n - 5} \\
 \underline{- n^3 + n^2} \\
 4n^2 - n - 5 \\
 \underline{- 4n^2 + 4n} \\
 -5n - 5 \\
 \underline{- -5n - 5} \\
 0
 \end{array}$$

$$\boxed{\text{Answer: } n^2 + 4n - 5}$$

$$\begin{array}{r}
 \overline{-3x^2 - 7x + 4} \\
 25) \quad -x+5 \overline{) 3x^3 - 8x^2 - 39x + 11} \\
 \underline{- 3x^3 + 15x^2} \\
 7x^2 - 39x + 11 \\
 \underline{- 7x^2 + 35x - 11} \\
 -4x + 11 \\
 \underline{- -4x + 20} \\
 -9
 \end{array}$$

$$\boxed{\text{Answer: } -3x^2 - 7x + 4 \div -9 \text{ } 5-x}$$

$$27) \quad 5x+4 \overline{) 5x^2-11x-12}$$

$$\quad \underline{- 5x^2+4x}$$

$$\quad \quad -15x-12$$

$$\quad \quad \underline{-15x-12}$$

$$\quad \quad \quad 0$$

Answer: $x-3$

$$39) \quad x^2+3 \overline{) x^4-x^3+5x^2-3x+6}$$

$$\quad \underline{- x^4 \quad + 3x^2}$$

$$\quad \quad -x^3+2x^2-3x+6$$

$$\quad \quad \underline{- x^3 \quad \quad -3x}$$

$$\quad \quad \quad 2x^2 \quad +6$$

$$\quad \quad \quad \underline{- 2x^2 \quad +6}$$

$$\quad \quad \quad \quad 0$$

Answer: x^2-x+2

$$53). \quad -r+1 \overline{) -30,000r^3+30,000}$$

$$a) \quad -r+1 \overline{) \begin{array}{r} 30,000r^2+30,000r+30,000 \\ -30,000r^3 \qquad \qquad \qquad +30,000 \\ \hline -30,000r^3+30,000r^2 \\ \hline \quad -30,000r^2 \qquad \qquad \qquad +30,000 \\ \hline \quad \quad -30,000r^2+30,000r \\ \hline \quad \quad \quad -30,000r+30,000 \\ \hline \quad \quad \quad -30,000r+30,000 \\ \hline \quad \quad \quad \quad 0 \end{array}}$$

Answer: $30,000r^2 + 30,000r + 30,000$

$$b) \quad r=1.04 : \text{ cumulative earnings} = \$93,648$$

⊗ requires a calculator ⊗