Assignment #1 - Solutions
943-DW section 1
Fall 2014
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Section 1.4 (22, 24, 32, 40, 44, 66, 60)

22. $\left(\frac{3}{n^3}\right)^3 = \frac{27}{n^9}$

24. $6v^0 = 6$

32. $(-y^3)^5 = -y^{15}$

40. $\frac{(3t)^{-1}}{3t^{-1}} = \frac{3^{-1}t^{-1}}{3t^{-1}} = \frac{1}{9}$

44. $ax^{-2}(-a^2x)^3$
$= ax^{-2}(-a^6x^3)$
$= -a^7x$

60. Is $a^{-2} < a^{-1}$ for any negative value of a?

Consider:
$a^{-2} < a^{-1}$
$\frac{1}{a^2} < \frac{1}{a}$ when a is negative

$\frac{1}{a^2}$ is always +
& $\frac{1}{a}$ is always − so there is no way that $a^{-2} < a^{-1}$!

66. $\frac{9M}{2\pi fC(2\pi fM)^2} = \frac{9M}{2\pi fC(2^2\pi^2f^2M^2)} = \frac{9M}{2^3\pi^3f^3CM^2} = \frac{9}{2^3\pi^3f^3CM}$

Section 11.1 (30-36, 44-46)

30. $(3x+2y)^{-2} = \frac{1}{(3x+2y)^2}$

31. $(2a^{-n})^2\left(\frac{3}{2a^n}\right)^{-1}$
$= 2^2a^{-2n}\left(\frac{2a^n}{3}\right)$
$= \frac{2^3}{3}\frac{a^n}{a^{2n}}$
$= \frac{2^3}{3a^n}$

32. $(7\times 3^{-a})\left(\frac{3^a}{7}\right)^2$
$= \frac{7}{3^a}\left(\frac{3^{2a}}{7^2}\right)$
$= \frac{3^a}{7}$

33. $\left(\frac{3a^2}{4b}\right)^{-3}\left(\frac{4}{a}\right)^{-5}$
$= \left(\frac{4b}{3a^2}\right)^3\left(\frac{a}{4}\right)^5$
$= \frac{4^3b^3a^5}{3^3a^64^5} = \frac{b^3}{3^34^2a}$

35. $\left(\frac{V^{-1}}{2t}\right)^{-2}\left(\frac{t^2}{V^{-2}}\right)^{-3}$
$= \left(\frac{2t}{V^{-1}}\right)^2\left(\frac{V^{-2}}{t^2}\right)^3$
$= \left(\frac{2^2t^2}{V^{-2}}\right)\left(\frac{V^{-6}}{t^6}\right) = \frac{2^2}{V^4t^4}$

36. $ab\left(\frac{a^{-2}}{b^2}\right)^{-3}\left(\frac{a^{-3}}{b^5}\right)^2$
$= ab\left(\frac{a^6}{b^{-6}}\right)\left(\frac{a^{-6}}{b^{10}}\right)$
$= a/b^3$

Section 11.1

44. $2(2^{-3}-4^{-1})^{-2}$

$= \dfrac{2}{(2^{-3}-4^{-1})^2}$

$= \dfrac{2}{\left(\frac{1}{2^3}-\frac{1}{4}\right)^2}$

$= \dfrac{2}{\left(\frac{1}{8}-\frac{2}{8}\right)^2}$

$= \dfrac{2}{\left(\frac{-1}{8}\right)^2}$

$= \dfrac{2}{\frac{1}{64}}$

$= 128$

45. $\dfrac{6^{-1}}{4^{-2}+2}$

$= \dfrac{\frac{1}{6}}{\frac{1}{16}+\frac{32}{16}}$

$= \dfrac{\frac{1}{6}}{\frac{33}{16}}$

$= \dfrac{16}{6\cdot 33}$

$= \dfrac{8}{99}$

46. $\dfrac{x-y^{-1}}{x^{-1}-y}$

$= \dfrac{x-\frac{1}{y}}{\frac{1}{x}-y}$

$= \dfrac{\frac{xy-1}{y}}{\frac{1-xy}{x}}$

$= \left(\dfrac{xy-1}{y}\right)\cdot\left(\dfrac{x}{1-xy}\right)$

$= \left(\dfrac{xy-1}{y}\right)\cdot\dfrac{x}{-(xy-1)}$

$= -\dfrac{x}{y}$

34. $(2np^{-2})^{-2}(4^{-1}p^2)^{-1}$

$= (2^{-2}n^{-2}p^4)(4p^{-2})$

$= \left(\dfrac{p^4}{2^2n^2}\right)\left(\dfrac{4}{p^2}\right)$

$= \dfrac{p^2}{n^2}$

Section 1.6 (13-24, 52)

13. $\sqrt[3]{125} = 5$

14. $\sqrt[4]{16} = 2$

15. $\sqrt[3]{-216} = -6$

16. $\sqrt[5]{-32} = -2$

17. $(\sqrt{5})^2 = 5$

18. $(\sqrt[3]{31})^3 = 31$

19. $(-\sqrt[3]{-47})^3$
$= -(-47) = 47$

20. $(\sqrt[5]{-23})^5 = -23$

21. $(-\sqrt[4]{53})^4 = 53$

22. $-\sqrt{32} = -\sqrt{16 \cdot 2}$
$= -\sqrt{16}\sqrt{2}$
$= -4\sqrt{2}$

23. $\sqrt{1200}$
$= \sqrt{3 \cdot 4 \cdot 100}$
$= \sqrt{3}\sqrt{4}\sqrt{100}$
$= 20\sqrt{3}$

24. $\sqrt{50} = \sqrt{25 \cdot 2}$
$= \sqrt{25}\sqrt{2}$
$= 5\sqrt{2}$

Section 1.7 (18, 33, 36, 49)

18. $\sqrt{A} + (h - 2\sqrt{A}) - 3\sqrt{A}$
$= \sqrt{A} + h - 2\sqrt{A} - 3\sqrt{A}$
$= h - 4\sqrt{A}$

33. $aZ - [3 - (aZ + 4)]$
$= aZ - 3 + (aZ + 4)$
$= 2aZ + 1$

36. $7y - \{y - [2y - (x - y)]\}$
$= 7y - \{y - [2y - x + y]\}$
$= 7y - \{y - 2y + x - y\}$
$= 7y - \{-2y + x\}$
$= 7y + 2y - x = 9y - x$

49. $\left[(\beta + \frac{4}{3}\alpha) + 2(\beta - \frac{2}{3}\alpha)\right] - \left[(\beta + \frac{4}{3}\alpha) - (\beta - \frac{2}{3}\alpha)\right]$
$= 2(\beta - \frac{2}{3}\alpha) + (\beta - \frac{2}{3}\alpha)$
$= 3(\beta - \frac{2}{3}\alpha) = 3\beta - 2\alpha$

Section 1.8 (35, 36, 49)

35. $-3(3 - 2T)(3T + 2)$
$= -3(9T + 6 - 6T^2 - 4T)$
$= -3(-6T^2 + 5T + 6)$
$= 18T^2 - 15T - 18$

36. $2n(5 - n)(6n + 5)$
$= (10n - 2n^2)(6n + 5)$
$= 60n^2 + 50n - 12n^3 - 10n^2$
$= -12n^3 + 50n^2 + 50n$

49. $3T(T + 2)(2T - 1)$
$= 3T(2T^2 + 3T - 2)$
$= 6T^3 + 9T^2 - 6T$

Section 1.9 (20, 34, 44)

20. $$\frac{9(aB)^4 - 6aB^4}{3aB^3} = \frac{9a^4B^4}{3aB^3} - \frac{6aB^4}{3aB^3} = 3a^3B - 2B$$

34.
$$\begin{array}{r} x^2 + 7x + 9 \\ 3x-2 \overline{)\ 3x^3 + 19x^2 + 13x - 20} \\ -(3x^3 - 2x^2) \\ \hline 21x^2 + 13x - 20 \\ -(21x^2 - 14x) \\ \hline 27x - 20 \\ -(27x - 18) \\ \hline -2 \end{array}$$

$$x^2 + 7x + 9 - \frac{2}{3x-2}$$

44.
$$\begin{array}{r} 2x - 3 \\ 3x+4 \overline{)\ 6x^2 - x + K} \\ -(6x^2 + 8x) \\ \hline -9x + K \\ -(-9x - 12) \\ \hline K + 12 \end{array}$$

Remainder is 0

$\Rightarrow K + 12 = 0$

$K = -12$

Section 1.10 (27-30, 35-38)

27. $7 - 3(1-2p) = 4 + 2p$

$7 - 3 + 6p = 4 + 2p$

$4p = 0$

$p = 0$

28. $3 - 6(2-3t) = t - 5$

$3 - 12 + 18t = t - 5$

$17t = 4$

$t = 4/17$

29. $\frac{4x - 2(x-4)}{3} = 8$

$4x - 2x + 8 = 24$

$2x = 16$

$x = 8$

30. $2x = \frac{3 - 5(7-3x)}{4}$

$8x = 3 - 35 + 15x$

$-7x = -32$

$x = 32/7$

35. $-0.24(c - 0.5) = 0.6$

$-0.24c + 0.12 = 0.63$

$-0.24c = 0.51$

$c = -2.125$

36. $27.5(5.17 - 1.44x) = 73.4$

$142.175 - 39.6x = 73.4$

$-39.6x = -68.775$

$x \approx 1.737$

37. $\frac{x}{2.0} = \frac{17}{6.0}$

$6x = 34$

$x = 34/6$

38. $\frac{3}{7} = \frac{R}{42}$

$\frac{42 \cdot 3}{7} = R$

$R = 18$

CHAPTER 1 - REVIEW (115, 120, 124, 125)

115. P_1 = cost of program 1

P_2 = cost of program 2 = $P_1 + 72$

$P_1 + P_2 = 190$

$P_1 + P_1 + 72 = 190$

$2P_1 = 118$

$P_1 = 59$

one program costs 59 $, the other 131 $

120. C_1 = concentration 1

$C_2 = 4C_1$ = concentration 2

$C_1 + 4C_1 = 4$ ppm

$5C_1 = 4$

$C_1 = 4/5 = 0.8$ ppm $C_2 = 4(0.8) = 3.2$ ppm

The two concentrations are 0.8 ppm & 3.2 ppm

124. d_1 = distance from pond to fire

$s_1 = 115$ Km/hr = speed from pond to fire

$t_1 = x$ = time from pond to fire

d_2 = distance from fire to pond

$s_2 = 175$ Km/hr = speed from fire to pond

t_2 = time from fire to pond $= 30 - x$

we know that $d_1 = d_2$

$$s_1 t_1 = s_2 t_2$$
$$115x = 175(30-x)$$
$$115x = 5250 - 175x$$
$$290x = 5250$$
$$x = 18.1 \text{ minutes}$$

It takes 18 minutes & 6 seconds to get from the pond to the fire.

125.

Grade 1	Grade 2		Final
0.5% additive	0.75% additive	=	0.65% addi.
x L	$1000 - x$ L		1000L

$$0.005x + 0.0075(1000-x) = 1000(0.0065)$$
$$0.005x + 7.5 - 0.0075x = 6.5$$
$$-0.0025x = -1$$
$$x = 400 \text{ L}$$

we need 400L of grade 1 & 600L of grade 2.

Section 6.3 (8, 12, 14, 24, 30, 40, 44)

8. $x^2 - 5x - 6$
$= (x-6)(x+1)$

12. $r^3 - 11r^2 + 18r$
$= r(r^2 - 11r + 18)$
$= r(r-9)(r-2)$

14. $D^2 + 8D + 16$
$= (D+4)^2$

24. $5R^4 - 3R^2 - 2$
$= 5R^4 - 5R^2 + 2R^2 - 2$
$= 5R^2(R^2-1) + 2(R^2-1)$
$= (R^2-1)(5R^2+2)$
$= (R+1)(R-1)(5R^2+2)$

30. $2z^2 + 13z - 5$
Not factorable

40. $12n^4 + 8n^2 - 15$
$= 12n^4 + 18n^2 - 10n^2 - 15$
$= 6n^2(2n^2+3) - 5(2n^2+3)$
$= (2n^2+3)(6n^2-5)$

44. $8r^2 - 14rs - 9s^2$
$= 8r^2 - 18rs + 4rs - 9s^2$
$= 2r(4r-9s) + s(4r-9s)$
$= (4r-9s)(2r+s)$

Section 6.5 (36, 40, 44, 48, 50, 60)

36. $\dfrac{20s - 5r}{10r - 5s} = \dfrac{5(4s-r)}{5(2r-s)} = \dfrac{4s-r}{2r-s}$

40. $\dfrac{10T^2 + 15T}{2T+3} = \dfrac{5T(2T+3)}{2T+3} = 5T$

44. $\dfrac{4a^2 + 12ab + 9b^2}{4a^2 + 6ab}$

$= \dfrac{4a^2 + 6ab + 6ab + 9b^2}{4a^2 + 6ab}$

$= \dfrac{2a(2a+3b) + 3b(2a+3b)}{2a(2a+3b)}$

$= \dfrac{(2a+3b)^2}{2a(2a+3b)} = \dfrac{2a+3b}{2a}$

48. $$\frac{5r^2+8rs-4s^2}{6r^2-17rs+5s^2}$$

$$= \frac{5r^2+10rs-2rs-4s^2}{6r^2-15rs-2rs+5s^2}$$

$$= \frac{5r(r+2s)-2s(r+2s)}{3r(2r-5s)-s(2r-5s)}$$

$$= \frac{(r+2s)(5r-2s)}{(2r-5s)(3r-s)}$$

50. $$\frac{3+x(4+x)}{3+x}$$

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

$$= \frac{(x+3)(x+1)}{(x+3)}$$

$$= x+1$$

60. $$\frac{(2x-3)(3-x)(x-7)(3x+1)}{(3x+2)(3-2x)(x-3)(7+x)}$$

$$= \frac{(2x-3)(-1)(x-3)(x-7)(3x+1)}{(3x+2)(-1)(2x-3)(x-3)(x+7)}$$

$$= \frac{(x-7)(3x+1)}{(3x+2)(x+7)}$$

Section 6.6 (22, 24, 36, 38, 39)

22. $$\frac{4R^2-36}{R^3-25R} \times \frac{7R-35}{3R^2+9R}$$

$$= \frac{(2R+6)(2R-6)}{R(R+5)(R-5)} \times \frac{7(R-5)}{3R(R+3)}$$

$$= \frac{4(R+3)(R-3)}{R(R+5)(R-5)} \times \frac{7(R-5)}{3R(R+3)}$$

$$= \frac{28(R-3)}{3R(R+5)(R+3)}$$

24. $$\left(\frac{2x^2-4x-6}{x^2-3x}\right)\left(\frac{x^3-4x^2}{4x^2-4x-8}\right)$$

$$= \frac{2(x^2-2x-3)x^2(x-4)}{x(x-3)4(x^2-x-2)}$$

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

$$= \frac{x(x-4)}{2(x-2)}$$

36. $\dfrac{2x^2-5x-3}{x-4} \times \dfrac{x^2-16}{x-3} \times \dfrac{3-x}{1}$

$= \dfrac{2x^2-6x+x-3}{x-4} \times \dfrac{(x+4)(x-4)}{x-3} \times \dfrac{(-1)(x-3)}{1}$

$= \dfrac{2x(x-3)+1(x-3)}{x-4} \times \dfrac{(x+4)(x-4)}{x-3} \times \dfrac{(-1)(x-3)}{1}$

$= \dfrac{(x-3)(2x+1)}{(x-4)} \times \dfrac{(x+4)(x-4)}{(x-3)} \times (-1)(x-3)$

$= -(2x+1)(x+4)(x-3)$

38. $\dfrac{2M^2+4M+2}{6M-6} \times \dfrac{M^2-1}{5M+5}$

$= \dfrac{2(M^2+2M+1)}{6(M-1)} \times \dfrac{(M+1)(M-1)}{5(M+1)}$

$= \dfrac{2(M+1)(M+1)(M+1)(M-1)}{30(M-1)(M+1)}$

$= \dfrac{(M+1)^2}{15}$

39. $\left(\dfrac{x(a+b)+y(a+b)}{p-q}\right)\left(\dfrac{3p^2+7pa-3pa-7q^2}{a+b}\right)$

$= \dfrac{(a+b)(x+y)}{(p-a)}\left[\dfrac{p(3p+7a)-a(3p+7a)}{(a+b)}\right]$

$= \dfrac{(a+b)(x+y)}{(p-a)}\dfrac{(p-a)(3p+7a)}{(a+b)}$

$= (x+y)(3p+7a)$

Section 6.8 (24, 26, 28, 30)

24. $\frac{4}{4-x} + 2 - \frac{2}{12-3x} = \frac{1}{3}$

$\frac{-4}{(x-4)} + 2 + \frac{2}{3(x-4)} = \frac{1}{3}$

$\frac{-12}{3(x-4)} + \frac{6(x-4)}{3(x-4)} + \frac{2}{3(x-4)} = \frac{(x-4)}{3(x-4)} \qquad x \neq 4$

$-12 + 6x - 24 + 2 = x - 4$

$6x - 34 = x - 4$

$5x = 30$

$x = 6$

26. $\frac{3}{t+3} - \frac{1}{t} = \frac{5}{6+2t}$

$\frac{3}{t+3} - \frac{1}{t} = \frac{5}{2(t+3)}$

$\frac{6t}{2t(t+3)} - \frac{2(t+3)}{2t(t+3)} = \frac{5t}{2t(t+3)} \qquad t \neq 0, -3$

$6t - 2t - 6 = 5t$

$-t = 6$

$t = -6$

28. $\frac{1}{2x+3} = \frac{5}{2x} - \frac{4}{2x^2+3x}$

$\frac{1}{2x+3} = \frac{5}{2x} - \frac{4}{x(2x+3)}$

$\frac{2x}{2x(2x+3)} = \frac{5(2x+3)}{2x(2x+3)} - \frac{8}{2x(2x+3)} \qquad x \neq 0, -3/2$

$2x = 10x + 15 - 8$

$-8x = 7$

$x = 7/-8$

30. $\frac{2}{x^2-1} - \frac{2}{x+1} = \frac{1}{x-1}$

$\frac{2}{(x+1)(x-1)} - \frac{2(x-1)}{(x+1)(x-1)} = \frac{x+1}{(x+1)(x-1)}$ $\quad x \neq \pm 1$

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

$2 - 2x + 2 = x+1$

$-3x = -3$

$x = 1$ impossible, no solution

Section 3.1 (20-24, 44)

20. $s(y) = 6\sqrt{y+11} - 3$

$s(-2) = 6\sqrt{9} - 3$

$= 18 - 3 = 15$

$s(a^2) = \sqrt{a^2+11} - 3$

21. $K(-s) = 3(-s)^2 - (-s)$

$= 3s^2 + s$

$K(2s) = 3(2s)^2 - (2s)$

$= 12s^2 - 2s$

22. $T(-2t) = 5(-2t) + 7$

$= -10t + 7$

$T(t+1) = 5(t+1) + 7$

$= 5t + 12$

23. $f(3x) - 3f(x)$

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

$= 6x + 4 - 6x - 12$

$= -8$

24. $f(x+2) - [f(x)+2]$

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

$= 2x^2 + 8x + 8 + 1 - 2x^2 - 3$

$= 8x + 6$

44. $f(R+10) = \frac{200(R+10)}{(100+R+10)^2}$

$= \frac{200(R+10)}{(110+R)^2}$

Section 3.2 (8, 12, 20, 22)

8. $F(r) = \sqrt{r+4}$ domain: $[-4, \infty)$
b/c you can't have square root of a negative
range: $[0, \infty)$

12. $f(x) = \dfrac{-6}{\sqrt{2-x}}$ domain $(-\infty, 2)$ range $(-\infty, 0)$
at $x=2$ there is division by zero
& $x>2$ gives negative root
b/c $\sqrt{2-x} > 0$
then $\dfrac{-6}{\sqrt{2-x}} < 0$

20. $h(-8) = 2(-8) = -16$
$h(-0.5) = -0.5 + 1 = +0.5$

22. $g(0.2) = \dfrac{1}{0.2} = 5$
$g(0) = 0$