Intermediate Algebra
Lial / Hornsby / McGinnis (10th)
Practice for the final
SOLUTIONS

① $4(5x+5)-6(x-5) = 3x+100+x$

$20x+20-6x+30 = 3x+100+x$

$14x+50 = 4x+100$

$14x-4x = 100-50$

$10x = 50$

$x = 5$

② $0.5x-0.4(40+x) = -12$

$0.5x-16-0.4x = -12$

$0.1x = -12+16$

$0.1x = 4$

$x = 40$

③ mult. by lcd 54

$\frac{54(x+2)}{54} + \frac{54(x-4)}{27} = \frac{54(x-2)}{18}$

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

$x+2+2x-8 = 3x-6$

$3x-6 = 3x-6$

$0 = 0$

All Real #'s

④ $4x-(1-x)+5x+1 = 10x+4$

$4x-1+x+5x+1 = 10x+4$

$10x = 10x+4$

$0 = 4$

no soln	$\emptyset$

⑤ $-6y^2+wy-x=0$ for w

$wy = 6y^2+x$

$w = \frac{6y^2+x}{y}$

⑥ $5s+4p = tp-4$ for p

$4p-tp = -5s-4$

$p(4-t) = -5s-4$

$p = \frac{-5s-4}{4-t}$

mult. by -1

$p = \frac{5s+4}{t-4}$

⑦ rate = 3375 ft/min

from 6000 ft to 33,000 ft

$\frac{33,000-6000}{3375} = 8$ min

⑧

R.	P	T	=	I
9%	x	1		0.09x
8%	5000−x	1		0.08(5000−x)

$I_{9\%} + I_{8\%} = \$410$

$0.09x+0.08(5000-x)=410$

$0.09x+400-0.08x=410$

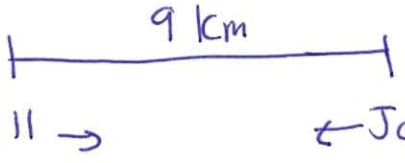
$0.01x = 10$

$x = \$1000$ at 9%

$\$4000$ at 8%

(9)

	kmph. R	hrs T	= D
Jill	2.5	2	
Joe	x	2	



$2.5(2) + x(2) = 9$

$5 + 2x = 9$

$2x = 4$

$x = 2$ kmph

(10) $x + x + 3x + 50 = 180$

$5x + 50 = 180$

$5x = 130$

$x = 26$

$x = 26°$

$x = 26°$

$3x + 50 = 3(26) + 50 = 128°$

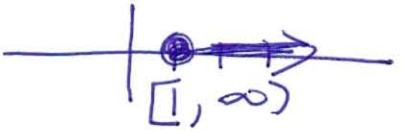
(11) $2 - 5(x+9) \le -3 - 9(x+5) + 9x$

$2 - 5x - 45 \le -3 - 9x - 45 + 9x$

$-5x \le -3 - 2$

$-5x \le -5$

$x \ge 1$



(12) $-8 \le \frac{4}{3}x - 4 \le 0$

lcd 3: $-24 \le 4x - 12 \le 0$

add +12 to all parts: $-12 \le 4x \le 12$

$\frac{-12}{4} \le \frac{4x}{4} \le \frac{12}{4}$

$-3 \le x \le 3$

(13)

A) $-5y \le -35$

$y \ge 7$

B) $-5y \ge -35$

$y \le 7$

C) $-5y \le 35$

$y \ge -7$

D) $-5y \ge 35$

$y \le -7$

(14) $\frac{85 + 91 + 89 + 89 + x}{5}$ less than 90

$\frac{354 + x}{5} < 90$

$354 + x < 450$

$x < 96$

(15) $\{4, 8, 11, 15, 20\} \cap \{8, 15, 20, 30\}$

[common parts]

$\{8, 15, 20\}$

(16) $\{4, 7, 14, 16\} \cup \{7, 16, 23, 27\}$

[everything]

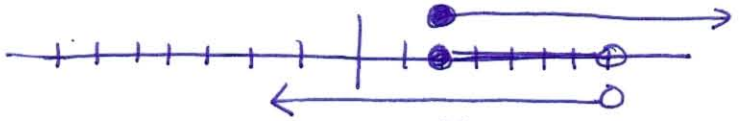
$\{4, 7, 14, 16, 23, 27\}$

(17) $3 \le 5x - 7$ and $3x + 1 < 19$
(intersection)

$10 \le 5x$ and. $3x < 18$

$2 \le x$ $x < 6$

$x \ge 2$



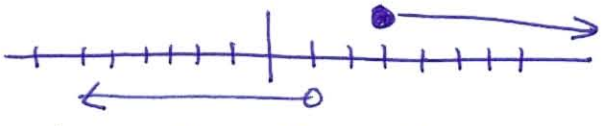
$[2, 6)$

(18) $-4x \le -12$ or union $6x - 4 < 2x$

$x \ge 3$ $6x - 2x < 4$

$4x < 4$

$x < 1$



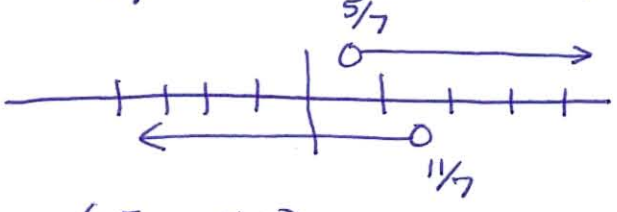
$(-\infty, 1) \cup [3, \infty)$

(19) $|7x - 8| < 3$ $<$ → and. (intersection)

$7x - 8 < 3$ and $7x - 8 > -3$

$7x < 11$ $7x > 5$

$x < 11/7$ $x > 5/7$



$(5/7, 11/7)$

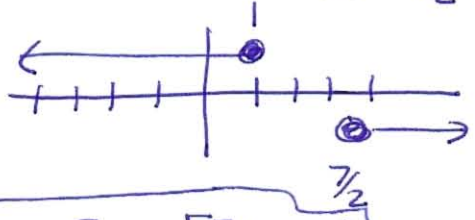
(20) $|9 - 4x| \ge 5$

$>$ → union

$9 - 4x \ge 5$ or

$9 - 4x \le -5$

$9 - 4x \ge 5$	$9 - 4x \le -5$
$-4x \ge -4$	$-4x \le -14$
$x \le 1$	$x \ge 14/4$
	$x \ge 7/2$



$(-\infty, 1] \cup [7/2, \infty)$

(21) $|y - 1| \le -9$

pos # $\le$ neg #

none.

$\emptyset$

(22) $|2k + 2| + 4 = 13$

$|2k + 2| = 9$

$2k + 2 = 9$ $2k + 2 = -9$

$2k = 7$ $2k = -11$

$k = 7/2$ $k = -11/2$

(23) $|2s-6| = |-2-s|$

$2s-6 = -2-s$ $\quad$ $2s-6 = -(-2-s)$

$2s+s = -2+6$ $\quad$ $2s-6 = 2+s$

$3s = 4$ $\quad$ $2s-s = 2+6$

$s = 4/3$ $\quad$ $s = 8$

(24) $5x-6y = -30$

x	y
-6	0
-4	5/3
-12/5	3

$5(-6)-6y = -30$

$-30-6y = -30$

$-6y = 0$

$y = 0$

$5x-6y = -30$

$5(-4)-6y = -30$

$-20-6y = -30$

$-6y = -10$

$y = \frac{-10}{-6} = \frac{5}{3}$

$5x-6(3) = -30$

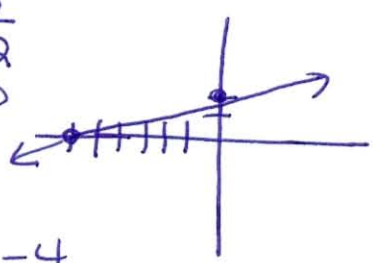
$5x-18 = -30$

$5x = -12$

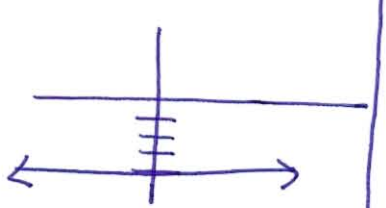
$x = -12/5$

(25) $2x-6y = -12$

x	y
0	2
-6	0



(26) $y = -4$



(27) $(1,-2)$ $(5,-9)$

$m = \frac{-2--9}{1-5}$

$= \frac{-2+9}{-4} = \frac{7}{-4}$

(28) undefined slope

$\Rightarrow$ vertical line

(29) $32x+12y = 3$

$12y = -32x+3$

$y = \frac{-32x}{12} + \frac{3}{12}$

$y = \frac{-8}{3}x + \frac{1}{4}$

$8y = 3x-6$

$y = \frac{3}{8}x - \frac{6}{8}$

since $\left(\frac{-8}{3}\right)\left(\frac{3}{8}\right) = -1$ (1)

(30)

$4x+y = -1$	$3y = 12x-9$
$y = -4x+1$	$y = 4x-3$

not the same, not //

not opposite reciprocals

so neither

(31) Average rate of change = slope

(1980, 131,000)
(2005, 66,000)

average rate of change $= \frac{131{,}000 - 66{,}000}{1980 - 2005} =$

$= \boxed{-2600 \text{ farms/year}}$

(32) $(-8, 7)$ $m = -8$

$y - y_1 = m(x - x_1)$
$y - 7 = -8(x - -8)$
$y - 7 = -8(x + 8)$
$y - 7 = -8x - 64$

slope-intercept: $y = -8x - 57$ | standard: $8x + y = -57$

(33) through $(-2, 1)$ & horizontal (y=cont.)

$\boxed{y = 1}$

(34) $(-3, -7)$ $\perp$ to $y = \frac{1}{3}x + 15$

need $m = -3$

$y - y_1 = m(x - x_1)$
$y + 7 = -3(x - -3)$
$y + 7 = -3x - 9$

$\boxed{y = -3x - 16}$ $\boxed{3x + y = -16}$

(35) $(7, -4)$
$(-4, 1)$

$m = \frac{-4 - 1}{7 - -4} = \frac{-5}{11}$

$m = \frac{y - y_1}{x - x_1}$

$\frac{-5}{11} = \frac{y + 4}{x - 7}$

$-5(x - 7) = 11(y + 4)$

$-5x + 35 = 11y + 44$
$-5x - 11y = 44 - 35$
9

$\boxed{5x + 11y = -9}$

$-11y = 5x + 9$

$\boxed{y = \frac{-5}{11}x + \frac{9}{-11}}$

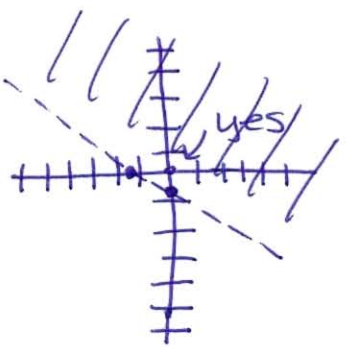
(36) $(6, -2)$
vertical (x=cont.)

$\boxed{x = 6}$

(37) $\boxed{C}$

(38) $4x + 7y > -5$

x	y
0	$-5/7$
$-5/4$	0



dotted

test (0,0)

$4(0) + 7(0) > -5$

$0 > -5$

true

(39) C passes vertical line test

(40) A since $-2, -9$ & $-2, 5$

(41) Domain: $x \geq 1$

Range: $\mathbb{R}$

vertex $= (1, -3/2)$

(42) D: $\{-5, 3, 6\}$

R: $\{0, 1, 9\}$

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

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

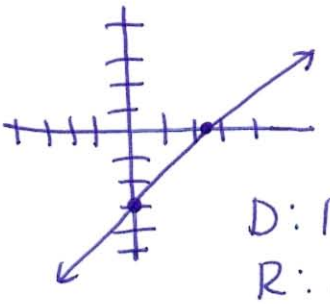
$= -4 + 10 + 3 = 9$

(44) $f(x) = -x^2 - 3x - 2$

$\boxed{f(a) = -a^2 - 3a - 2}$

(45) $f(x) = \frac{4}{3}x - 3$

x	y
0	-3
$9/4$	0



D: $\mathbb{R}$

R: $\mathbb{R}$

$3 = \frac{4}{3}x$

$9 = 4x$

$\frac{9}{4} = x$

(46) B

(47) $x - y = 2$

$x + y = 12$

$x - y = 2$

$7 - y = 2$

$-y = 2 - 7 = -5$

$y = 5$

① $x - y = 2$

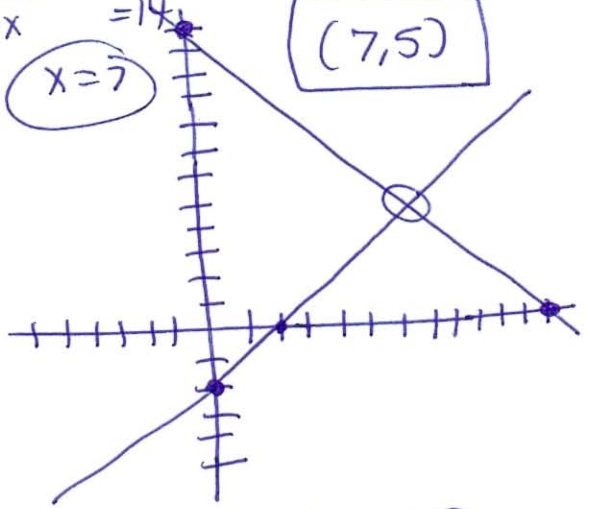
② $x + y = 12$

$2x = 14$

$x = 7$

(7,5)

(48)



$x - y = 2$

x	y
0	-2
2	0

$x + y = 12$

x	y
0	12
12	0

(48) ① $x + 8y = 6$
② $6x + 7y = -5$

-6 ① $-6x - 48y = -36$
② $6x + 7y = -5$
$-41y = -41$
$y = 1$

$x + 8y = 6$
$x + 8(1) = 6$
$x = -2$

$(-2, 1)$

(49) ① $-\frac{1}{2}x + y = 9$
② $x + 18 = 2y$

lcd 2 ① $-x + 2y = 18$
② $x - 2y = -18$
$0 = 0$
infinite solns

(50) ① $2x - y = 9$
② $4x + y = 21$
$6x = 30$
$x = 5$

$2x - y = 9$
$2(5) - y = 9$
$-y = -10$
$y = 1$

$(5, 1)$

(51) ① $-6x + 5y = -42$
② $2x + 3y = 14$

① $-6x + 5y = -42$
3 ② $6x + 9y = 42$
$14y = 0$
$y = 0$

$2x + 3y = 14$
$2x + 3(0) = 14$
$2x = 14$
$x = 7$

$(7, 0)$

(52)

P	· R	· T	= I	
$2x$	6%	1		$0.06(2x)$
x	2%	1		$0.02(x)$

$I_{6\%} + I_{2\%} = 700$

$0.06(2x) + 0.02(x) = 700$
$0.12x + 0.02x = 700$
$0.14x = 700$
$x = 5000$

$5000 at 2%
$10,000 at 6%

(53)

14%	+ 24%	= 20.5%
x	$120 - x$	120oz

$0.14x + 0.24(120 - x) = 120(0.205)$
$0.14x + 28.8 - 0.24x = 24.6$
$-0.1x = -4.2$
$x = 42$oz

42oz 14%
78oz 24%

(54)

$$\text{total cost} = \underset{\text{Set fee per day}}{x} + \underset{\text{cost per mile}}{y}\left(\underset{\text{\# miles}}{}\right)$$

① $129 = 3x + 300y$

② $232 = 5x + 600y$

$-2$① $-258 = -6x + -600y$

② $232 = 5x + 600y$

$-26 = -x$

$26 = x$

\$26 per day set fee $= x$

\$0.17 per mile $= y$

$129 = 3(26) + 300y$

$51 = 300y$

$0.17 = y$

(55)

$-7^2 + 11^0 - 5^{-2}$

$-49 + 1 - \frac{1}{5^2}$

$-49 + 1 \; \frac{-1}{25}$

$-48 \; \frac{-1}{25}$

$\frac{-1200}{25} - \frac{1}{25} = \frac{-1201}{25}$ (B)

(56) $(3p^2q^5)^{-2}(9p^4q^2)^2$

$3^{-2}p^{-4}q^{-10}\; 9^2p^8q^4$

$\frac{81p^8q^4}{9p^4q^{10}} = \frac{9p^4}{q^6}$

(57) $\frac{(6x^3y^2)^{-1}}{(3x^3y^3)^3}$

$\frac{6^{-1}x^{-3}y^{-2}}{3^3x^9y^9}$

$\frac{1}{3^3 \cdot 6^1 x^9 x^3 y^9 y^2}$

$3^3 = 27$

\$ $\frac{1}{162x^{12}y^{11}}$

(58) $\left(\frac{4x^2}{y^3}\right)^3\left(\frac{10x^2}{y^{-3}}\right)^{-2}$

$\frac{4^3x^6}{y^9}\;\frac{10^{-2}x^{-4}}{y^6}$

$\frac{4^3x^6}{10^2x^4y^9y^6}$

$\frac{64x^2}{100y^{15}}$ (16, 25)

$\frac{16x^2}{25y^{15}}$

(59) $5.79 \times 10^{-4} = \boxed{0.000579}$

4 places to the left

(60) $f(x) = 7x + 2$

$f(2) = 7(2) + 2 =$

$= 14 + 2 = (16)$

(61) $(f-g)(x)$

$= f(x) - g(x)$

$= (14x^2 + 9x + 2) - (3x^2 + 18x - 3)$

$= 14x^2 + 9x + 2 - 3x^2 - 18x + 3$

$= \boxed{11x^2 - 9x + 5}$

(62) $(f-g)(3) = f(3) - g(3)$

$f(3) = (3)^2 + 4 = 13$

$g(3) = 3(3) + 6 = 12$

$(f-g)(3) = 13 - 12 = (1)$

$f(x) = x^2 - 9$

$g(x) = 2x + 6$

$f(3) = (3)^2 - 9 = 0$

$g(3) = 2(3) + 6 = 12$

$0 - 12 = (-12)$

(63) $f(x) = x^2 + 4 \quad g(x) = 3x + 6$

$gof(7) = g(f(7)) = g(53)$

$= 3(53) + 6$

$= (165)$

$f(7) = 7^2 + 4 = 53$

(64) $f(x) = 5x^2 + 2x - 1$

$g(x) = x - 1$

$f(g(x))$

$f(x-1)$

$= 5(x-1)^2 + 2(x-1) - 1$

$= 5(x^2 - 2x + 1) + 2x - 2 -$

$= 5x^2 - 10x + 5 + 2x - 2 - 1$

$= \boxed{5x^2 - 8x + 2}$

(65) $f(x) = x^2 - 2$

$g(x) = 3x + 3$

$gof(x) = g(f(x))$

$= g(x^2 - 2)$

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

$= 3x^2 - 6 + 3$

$= \boxed{3x^2 - 3}$

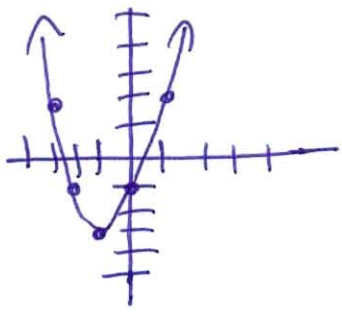
(66) $f(x) = x^2 + 2x - 1$

$h = \frac{-b}{2a} = \frac{-2}{2(1)} = (-1)$

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

$= 1 - 4 = (-3)$

x	y
-3	2
-2	-1
(-1)	(-3)
0	-1
1	2

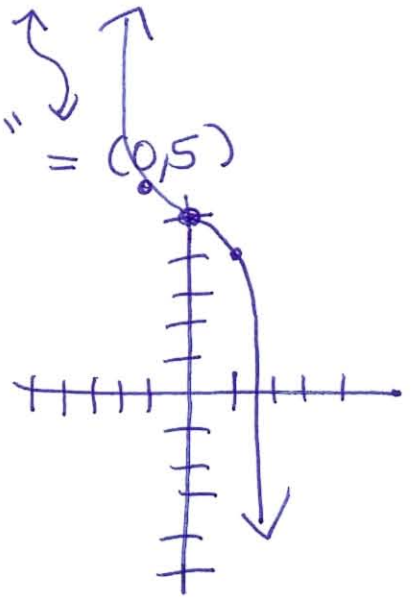


(67) $f(x) = -x^3 + 5$

shape ↕

"vertex" = (0, 5)

x	y
1	4
0	5
-1	6



(68) $(6k^3 + 4k^2 - k + 8) - (3k^3 - 2k^2 - k - 1) + (2k^3 + 8k^2 - k + 1)$

$6k^3 + 4k^2 - k + 8 - 3k^3 + 2k^2 + k + 1 + 2k^3 + 8k^2 - k + 1$

$5k^3 + 14k^2 - k + 10$

(69) $(3x + 10)(x - 10)$

$3x^2 - 30x + 10x - 100$

$3x^2 - 20x - 100$

(70) $(-7m - 8)(-8m^2 + m + 5)$

$56m^3 - 7m^2 - 35m$

$+64m^2 - 8m - 40$

$56m^3 + 57m^2 - 43m - 40$

(71) $(9x - 5y)^2 = (9x - 5y)(9x - 5y)$

$= 81x^2 - 45xy - 45xy + 25y^2$

$= 81x^2 - 90xy + 25y^2$

(72) $\dfrac{21x^3 + 21x^2 + 6x + 7}{3x}$

$\dfrac{21x^3}{3x} + \dfrac{21x^2}{3x} + \dfrac{6x}{3x} + \dfrac{7}{3x}$

$7x^2 + 7x + 2 + \dfrac{7}{3x}$

(73) $x - 4 \;\big|\; 2x^3 - 5x^2 - 3x - 30$

4 | 2 −5 −3 −30

8 12 36

2 3 9 6

$2x^2 + 3x + 9 + \dfrac{6}{x-4}$

(74) $f(x) = x^2 - x - 6$

$g(x) = x - 1$

$(f \cdot g)(x)$

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

$= x^3 - x^2 - 6x + 6$

$-x^2 + x$

$x^3 + 2x^2 - 5x - 2$

(75) $f(x) = x^2+9x+20$

$g(x) = x+4$

$\left(\frac{f}{g}\right)(x) = \frac{x^2+9x+20}{x+4} = \frac{(x+4)(x+5)}{(x+4)} = \boxed{x+5}$

(76) $f(x) = 12x^3+30x^2-6x-28$

$g(x) = 3x+9$

$\left(\frac{f}{g}\right)(2) = \frac{f(2)}{g(2)} = \frac{12(2)^3+3(2)^2-6(2)-28}{3(2)+9} = \boxed{\frac{175}{15}}$

(77) $12x^2y^5-6x^2y^3-36x^4y^3$

$\boxed{6x^2y^3(2y^2-1-6x^2)}$

(78) $8x+ay+ax+8y$

$8x+ax+ay+8y$

$x(8+a)+y(a+8)$

$\boxed{(8+a)(x+y)}$

(79) $6x^2+11x-72 \rightarrow 8.9$

3.2

$\boxed{(2x+9)(3x-8)}$

$ac = (6)(-72)$

(80) $4a^2+28ab+49b^2 \rightarrow$ perfect square

$(2a+7b)(2a+7b)$

perfect square $(2a+7b)^2$

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

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

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

$\boxed{(a+3)(a+b)(a-b)}$

(82) $4k^2-49j^2$

$\boxed{(2k+7j)(2k-7j)}$

(83) y^3-512

$a=y \quad b=8$

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

$= \boxed{(y-8)(y^2+8y+64)}$

(84) $3x^2+28x=-49$

$3x^2+28x+49=0$

$(3x+7)(x+7)=0$

$3x+7=0$ $\quad$ $x+7=0$

$3x=-7$ $\quad$ $x=-7$

$x=-\frac{7}{3}$

(85) $4x^2-10x=0$

$2x(2x-5)=0$

$2x=0$ $\quad$ $2x-5=0$

$x=0$ $\quad$ $2x=5$

$x=5/2$

(86) $(2x+1)(x+7)=24$

$2x^2+14x+x+7=24$

$2x^2+15x-17=0$

$(2x+17)(x-1)=0$

$2x+17=0$ $\quad$ $x-1=0$

$2x=-17$ $\quad$ $x=1$

$x=-\frac{17}{2}$

so $L=x+7=8$

$w=2x+1=2(1)+1=3$

(87) $f(t)=-16t^2+96t$

$128=-16t^2+96t$

$16t^2-96t+128=0$

$16(t^2-6t+8)=0$

$16(t-2)(t-4)=0$

$t=2s$ $\quad$ $t=4s$

(88) $r(x)=\frac{x^2-9x}{x^2-2x-48}$

$=\frac{x(x-9)}{(x-8)(x+6)}$

$D=\mathbb{R}$ except 8 & -6

(89) $\frac{a^2-36}{a^2+9a+18}$

$\frac{(a+6)(a-6)}{(a+6)(a+3)}=\frac{a-6}{a+3}$

(90) $\frac{7x+21}{x+2}\cdot\frac{3x^2+12x+12}{x^2-9}$

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

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

$\frac{21(x+2)}{(x-3)}$

(91) $\dfrac{4x-4y}{20-5z} \div \dfrac{2y-2x}{z-4}$

$\dfrac{2}{4(x-y)} \cdot \dfrac{-1}{5(4-z)} \cdot \dfrac{-1}{2(y-x)} = \dfrac{2}{5}$

(92) $\dfrac{x^2-36}{x^2-20x+100} \cdot \dfrac{x^2-9x-10}{2x-12}$

$\dfrac{(x+6)(x-6)}{(x-10)(x-10)} \cdot \dfrac{(x-10)(x+1)}{2(x-6)}$

$= \boxed{\dfrac{(x+6)(x+1)}{(x-10)\cdot 2}}$

(93) $4a+12 = 4(a+3)$

$a^2+3a = a(a+3)$

$\boxed{lcd = 4a(a+3)}$

(94) $\dfrac{2}{15x} + \dfrac{4}{21x^2}$

$lcd = 3\cdot 5\cdot 7x^2 = 105x^2$

$\dfrac{2(7x)+4(5)}{105x^2}$

$\dfrac{14x+20}{105x^2} = \boxed{\dfrac{2(7x+10)}{105x^2}}$

(95) $\dfrac{1}{8x^4y^2} - \dfrac{11}{2xy}$

$lcd = 8x^4y^2$

$\dfrac{1-11(4)x^3y}{8x^4y^2}$

$\boxed{\dfrac{1-44x^3y}{8x^4y^2}}$

(96) $\dfrac{x}{x^2-16} - \dfrac{6}{x^2+5x+4}$

$\dfrac{x}{(x+4)(x-4)} \quad \dfrac{6}{(x+4)(x+1)}$

$lcd = (x+4)(x-4)(x+1)$

$\dfrac{x(x+1)-6(x-4)}{(x+4)(x-4)(x+1)}$

$\dfrac{x^2+x-6x+24}{(x+4)(x-4)(x+1)}$

$\boxed{\dfrac{x^2-5x+24}{(x+4)(x-4)(x+1)}}$

(97) $\frac{7}{x-1} - \frac{x}{x-4} + \frac{x^2+28}{x^2-5x+4}$

$x^2-5x+4 = (x-1)(x-4)$

$\frac{7(x-4) - x(x-1) + x^2+28}{lcd}$

$\frac{7x - 28 - x^2 + x + x^2 + 28}{lcd}$

$\boxed{\frac{8x}{(x-1)(x-4)}}$

(98) $\frac{12x+24}{7} \cdot \frac{5}{15x+30}$

$\frac{4}{12(x+2)} \cdot \frac{5}{15(x+2)} = \frac{4}{7}$

(99) $\frac{\frac{7}{x} - \frac{x}{7}}{\frac{1}{7} - \frac{1}{x}}$ $\quad lcd\ 7x$

$= \frac{7(7) - x^2}{x - 7}$

$= \frac{49 - x^2}{x-7} = \frac{(7+x)(7-x)}{(x-7)}$ $\quad -1$

$= \boxed{-1(7+x)}$

(100) a) equation

b) expression

(101) $\frac{2}{t} = \frac{t}{5t-12}$

$2(5t-12) = t^2$

$10t - 24 = t^2$

$0 = t^2 - 10t + 24$

$0 = (t-6)(t-4)$

$t = 6$ $\quad t = 4$

(102) $\frac{6}{y+2} - \frac{3}{y-2} = \frac{9}{y^2-4}$

$y^2-4 = (y+2)(y-2)$

$lcd = (y+2)(y-2)$

$6(y-2) - 3(y+2) = 9$

$6y - 12 - 3y - 6 = 9$

$3y - 18 = 9$

$3y = 27$

$y = 3$

(103) $$\frac{z^2+5z}{z^2+2z}$$

$z(z+2)$

So $z \neq 0$ | $z \neq -2$

(104) $-\sqrt{256} = -16$

(105) $\sqrt[3]{-125} = -5$

(106) $27^{1/3} = \sqrt[3]{27} = 3$

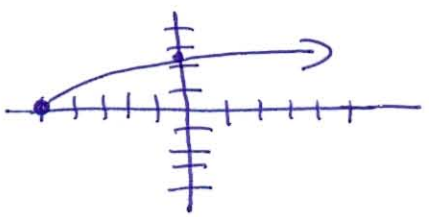
(107) $\sqrt{121.01} = 11$ A

(108) $\sqrt{151} = 12.29$

(109) $\sqrt[3]{-75} = -4.217$

(110) $f(x) = \sqrt{x+5}$

(-5, 0)
up, R



(111) $\left(\frac{4}{25}\right)^{-3/2} = \left(\frac{2}{5}\right)^{-3} = \left(\frac{5}{2}\right)^{3} = \frac{125}{8}$

Square
cube root
flip.

(112) $(-8)^{-2/3} = (-2)^{-2} = \left(\frac{-1}{2}\right)^{2} = \frac{1}{4}$

(113) $$\frac{2^{3/4} x^{-2/3} y^{3/2}}{2^{-5/4} x^{7/3} y^{1/4}}$$

$$\frac{2^{3/4} 2^{5/4} y^{6/4}}{x^{7/3} x^{2/3} y^{1/4}}$$

$$\frac{2^2 y^{5/4}}{x^3} = \frac{4y^{5/4}}{x^3}$$

(114) $$\left(\frac{x^{-7} y^{-4}}{x^{-4} y^5}\right)^{-3/5}$$

$$\left(\frac{x^4}{x^7 y^5 y^4}\right)^{-3/5}$$

$$\left(\frac{1}{x^3 y^9}\right)^{-3/5} =$$

$$(x^3 y^9)^{3/5}$$

$$x^{9/5} y^{27/5}$$

(115) $14^{5/8} \cdot 14^{-1/8} = 14^{5/8 - 1/8} = 14^{4/8} = \sqrt{14}$

(116) $\sqrt[3]{x^5}\ \sqrt[3]{x^8} = \sqrt[3]{x^{13}} = x^{13/3}$

(117) $b^2 + 15^2 = 19^2$

$b^2 + 225 = 361$

$b^2 = 136$

$b = \sqrt{136}$

$b = 2\sqrt{34}$

2 | 136
2 | 68
2 | 34
17

(118) $(-3, 8)$ $(1, 5)$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(-3-1)^2 + (8-5)^2}$

$= \sqrt{(-4)^2 + 3^2} = \sqrt{25} = 5$

(119) $\sqrt{80 k^7 q^8}$

$= 4k^3 q^4 \sqrt{5k}$

2 | 80
2 | 40
2 | 20
2 | 10
5

(120) $\sqrt[3]{27 a^8 b^5} = 3a^2 b \sqrt[3]{a^2 b^2}$

aaa aaa aa
bbb bb

(121) $\sqrt{3} \cdot \sqrt[3]{4}$

$3^{1/2} \cdot 4^{1/3}$

$3^{3/6} \cdot 4^{2/6}$

$\sqrt[6]{3^3} \cdot \sqrt[6]{4^2}$

$\sqrt[6]{432}$

(122) $\sqrt{75} + 10\sqrt{243} - 6\sqrt{48}$

$3|75$, $5|25$, 5 → $75 = 3 \cdot 5^2$

$3|243$, $3|81$, $3|27$, $3|9$, 3 → $243 = 3^5$

$2|48$, $2|24$, $2|12$, $2|6$, 3 → $48 = 2^4 \cdot 3$

$5\sqrt{3} + 10 \cdot 9\sqrt{3} - 6 \cdot 2 \cdot 2\sqrt{3}$

$5\sqrt{3} + 90\sqrt{3} - 24\sqrt{3} = \boxed{71\sqrt{3}}$

(123) $\sqrt[3]{108x^9y^7} - \sqrt[3]{32x^{12}y^4}$

$2|108$, $2|54$, $3|27$, $3|9$, 3 → $108 = 2^2 \cdot 3^3$ (only 2 twos)

$2|32$, $2|16$, $2|8$, $2|4$, 2 → $32 = 2^5$

$3x^3y^2\sqrt[3]{4y} - 2x^4y\sqrt[3]{4y}$

$\boxed{(3x^3y^2 - 2x^4y)(\sqrt[3]{4y})}$

(124) $(4\sqrt{3} + 11)(7\sqrt{3} - 3)$

$28\sqrt{9} - 12\sqrt{3} + 77\sqrt{3} - 33$

$28(3) - 3\sqrt{3} + 77\sqrt{3} - 33$

84

$\boxed{51 + 65\sqrt{3}}$

(125) $(3 - 2\sqrt{3})(3 - 2\sqrt{3})$

$9 - 6\sqrt{3} - 6\sqrt{3} + 4(3)$

$9 - 12\sqrt{3} + 12$

$\boxed{21 - 12\sqrt{3}}$

(126) $\frac{-6}{\sqrt{66}} \cdot \frac{\sqrt{66}}{\sqrt{66}}$

$= \frac{-6\sqrt{66}}{66} = \boxed{\frac{-\sqrt{66}}{11}}$

(127) $\frac{3}{\sqrt[3]{2}} \cdot \frac{\sqrt[3]{4}}{\sqrt[3]{4}}$

2 more 2's

$\frac{3\sqrt[3]{4}}{\sqrt[3]{8}} = \boxed{\frac{3\sqrt[3]{4}}{2}}$

(128) $\frac{-30}{\sqrt{8} + \sqrt{2}} \cdot \frac{\sqrt{8} - \sqrt{2}}{\sqrt{8} - \sqrt{2}}$

$= \frac{-30\sqrt{8} - 30\sqrt{2}}{\sqrt{64} - \sqrt{16} + \sqrt{16} - \sqrt{4}}$

$\sqrt{8} = 2\sqrt{2}$

$\frac{-30(2\sqrt{2}) - 30\sqrt{2}}{8 - 2}$

$\frac{-60\sqrt{2} - 30\sqrt{2}}{6}$

$\frac{-90\sqrt{2}}{6} =$

$\boxed{-15\sqrt{2}}$

* The book answer can be simplified to $\boxed{\frac{-\sqrt{66}}{11}}$

(129) $\frac{12+\sqrt{45}}{3} = \frac{12}{3} + \frac{3\sqrt{5}}{3} = 4+\sqrt{5}$

(130) $L = \sqrt{\frac{2w}{k}}$ $\quad 3.1 = \sqrt{\frac{2w}{50.9}}$

$k = 50.9$
$L = 3.1$
$w = ?$

$(3.1)^2 = \frac{2w}{50.9}$

$\frac{(3.1)^2(50.9)}{2} = w$

$244.6 \text{ ft lbs} = w$

(131) $\sqrt[3]{11x} = \sqrt[3]{4x-35}$

$11x = 4x - 35$

$11x - 4x = -35$

$7x = -35$

$x = -5$

(132) $5x + \sqrt{x+42} = 7+3x$

$\sqrt{x+42} = 7-2x$

$(\sqrt{x+42})^2 = (7-2x)^2$

$x+42 = 49 - 14x - 14x + 4x^2$

$x+42 = 4x^2 - 28x + 49$

$0 = 4x^2 - 29x + 7$

$0 = (4x-1)(x-7)$

$4x-1=0$ $\quad x-7=0$

$x = 1/4$ $\quad x = 7$

Both answers check.

(133) $(-5+4i)-(6+3i)-11i$

$-5+4i-6-3i-11i$

$\boxed{-11-10i}$

(134) $(2+6i)(9+5i)$

$18+10i+54i+30i^2$

$18+64i+30(-1)$

$\boxed{-12+64i}$

(135) $\dfrac{9+i}{1-i}\cdot\dfrac{1+i}{1+i}=\dfrac{9+9i+i+i^2}{1+i-i-i^2}=\dfrac{8+10i}{2}$

$i^2=-1$, $-i^2=-(-1)$

$=\boxed{4+5i}$

(136) $i^5=(i^2)^2\cdot i=(-1)^2\cdot i=\boxed{i}$

(137) $i^3=i^2\cdot i=(-1)\cdot i=-i$ $\boxed{\text{true}}$

(138) $y^2=8$

$y=\pm\sqrt{8}=\boxed{\pm 2\sqrt{2}}$

(139) $(6s+3)^2=4$

$6s+3=\pm\sqrt{4}=\pm 2$

$6s+3=2$ $\quad 6s=-1$ $\quad \boxed{s=-\frac{1}{6}}$

$6s+3=-2$ $\quad 6s=-5$ $\quad \boxed{s=-\frac{5}{6}}$

(140) $3m^2+10m+4=0$

$a=3 \quad b=10 \quad c=4$

$D=b^2-4ac$

$=(10)^2-4(3)(4)$

$=100-48$

$=52$

$\sqrt{D}=\sqrt{52}=2\sqrt{13}$

$x=\dfrac{-b\pm\sqrt{D}}{2a}=\dfrac{-10\pm 2\sqrt{13}}{2(3)}$

$=\dfrac{-10\pm 2\sqrt{13}}{6}=\boxed{\dfrac{-5\pm\sqrt{13}}{3}}$

(141) $8x^2+7x+2=0$

$a=8 \quad b=7 \quad c=2$

$D = b^2-4ac$

$= (7)^2-4(8)(2) = -15$

$\sqrt{D} = \sqrt{-15} = i\sqrt{15}$

$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{-7 \pm i\sqrt{15}}{16}$

(142) $-x^2 = -49k$

$x^2 = 49k$

let $k=1$ (positive)

$x^2 = 49(1)$

$x^2 = 49$

$x = \pm 7$ ← 2 real solutions

so false

(143) $16x^2-8x+1=0$

$a=16 \quad b=-8 \quad c=1$

$D = b^2-4ac$

$= (-8)^2 - 4(16)(1) = 0$

so 1 rational solution.

(144) $\frac{1}{1} - \frac{4}{x} \quad \frac{-45}{x^2} = 0$

lcd $= x^2$

(144) continued

$x^2-4x-45=0$

$(x-9)(x+5)=0$

$x=9$ $x=-5$

(145) $(-2p+5)^2$

$= -5(-2p+5)-4$

so let $a = -2p+5$

$a^2+5a-4=0$

$(a+4)(a+1)=0$

$a+4=0$

$-2p+5+4=0$

$-2p+9=0$

$-2p=-9$

$p=4.5$

$a+1=0$

$-2p+5+1=0$

$-2p+6=0$

$-2p=-6$

$p=3$

(146)

Ron $2+x$

Paul x

together 3

$$\frac{1}{2+x} + \frac{1}{x} = \frac{1}{3}$$

$lcd = 3x(2+x)$

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

Quad. formula

$a=1 \quad b=-4 \quad c=-6$

$D = b^2 - 4ac$
$= (-4)^2 - 4(1)(-6)$
$= 16 + 24 = 40$

$$x = \frac{+4 \pm \sqrt{40}}{2(1)}$$

5.16 hrs $\approx$ 5.2 hrs

or

~~-2.32~~ hrs

Paul = x
= 5.2 hrs

Ron = 2 + x
= 2 + 5.2
= 7.2 hrs

(147)

	R	· T	=	D
with	$x+50$	4	=	$4(x+50)$
against	$x-50$	4	=	$4(x-50)$

x = speed of plane in still air

wind = 50

$4(x+50) = 1500$ ← distance travelled with the wind.

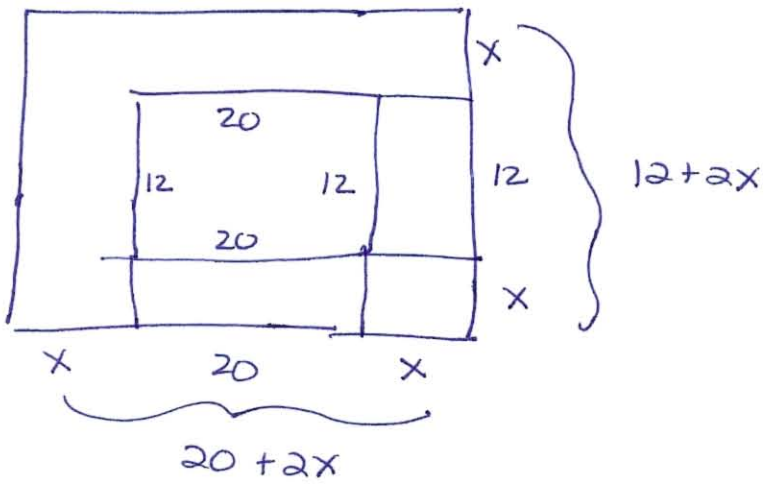
$4x + 200 = 1500$

$4x = 1300$

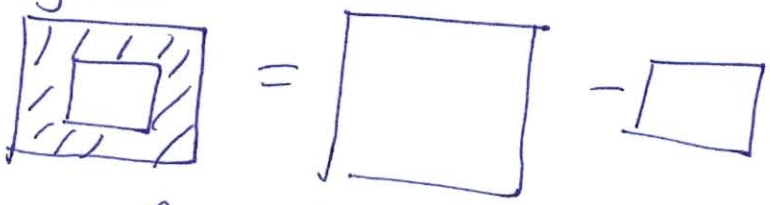
x = 325 mph in still air

* The book answer is off.

148



Area of gravel



$A = 228\ ft^2$

$A = (12+2x)(20+2x) - (12x20)$

$A = 240 + 24x + 40x + 4x^2 - 240$

$A = 4x^2 + 64x$

$228 = 4x^2 + 64x$

$0 = 4x^2 + 64x - 228$

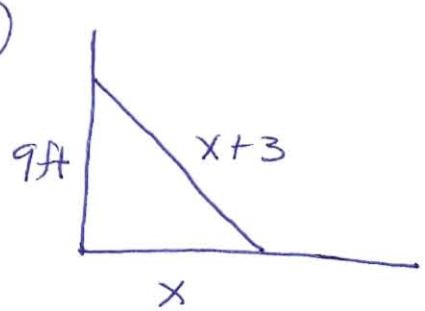
$0 = 4(x^2 + 16x - 57)$

$0 = 4(x+19)(x-3)$

$x = 3 \qquad x \neq -19$

So path width is 3 ft

149



$9^2 + x^2 = (x+3)^2$

$81 + x^2 = x^2 + 6x + 9$

$81 = 6x + 9$

$72 = 6x$

$12 = x$

Ladder length

$x + 3$

$12 + 3 = 15$ ft

150

$y = -x^2 + 2x - 3$

vertex $= (h, k)$

$h = \frac{-b}{2a} = \frac{-2}{2(-1)} = 1$

$k = -(1)^2 + 2(1) - 3$

$= -1 + 2 - 3 = -2$

vertex $= (1, -2)$

down

x	y
0	-3
1	-2
2	-3