

Solutions to Student Review Problems

1. $(x - 3)^2 + (y + 8)^2 = 64$
2. (a) $\sqrt{9.25}$
(b) $3\sqrt{13}$
(c) $2\sqrt{5}$
3. $\sqrt{5}$
4. 1107.8932
5. $m = \frac{-9}{2}$, x-int: (-2,0)
6. $y = 5x - 7$
7. $y = 2x$
8. (a) $y = \frac{-4}{3}x + a$, where a is any negative number
(b) $y = \frac{3}{4}x + b$, where $b \neq \frac{-14}{4}$
(c) $y = \frac{-4}{3}x + \frac{4}{3}c$, where c is any negative number
9. (a) $y = 1.5x + a$, where a is any negative number
(b) $y = \frac{-2}{3}x + \frac{2}{3}b$, where b is any positive number
10. $y = \frac{-1}{5}x + \frac{27}{5}$
11. Impossible to have such a line; the line through the points has a slope of 1 and the slope of the line perpendicular to the given line is 2.
12. (a) $x = \#$ of miles; $y = \text{cost/week}$ (in \$)
Hertz: $y = 0.20x + 350$
Sun Valley: $y = 0.25x + 280$
(b) Graph on calculator. They intersect at (1400,360).
(c) It depends. If he drives less than 1400 miles, he should rent from Sun Valley, but if he drives between 1400 and 3000 miles he should rent from Hertz. (At 1400 miles the costs are equal.)
13. $V(t) = \left(\frac{-2500}{3}\right)t + 15000$
14. (a) $V(t) = -100t + 5000$
(b) \$100/month
(c) \$2600
15. (a) $V(t) = -1000t + 20000$
(b) \$1000/year
(c) \$12,000
16. (a) $V(t) = \left(\frac{-8300}{7}\right)t + 13500$
(b) Approx. \$1185.71/year
(c) Approx. \$9942.86
17. (a) Approx. \$2516.67/year
(b) \$12,583.33
18. (a) $C(x) = 130x + 590$
(b) $R(x) = 13500x$
(c) \$199,960
19. (a) $C(x) = \frac{15}{14}x + \frac{3000}{7}$
(b) $R(x) = 5x$
(c) \$196,000
20. $C(x) = 0.025x + 2$
21. (a) $C(x) = 10x + 50000$; $R(x) = 30x$
(b) (2500,\$75,000)
(c) $P(x) = 20x - 50000$
22. (a) $C(x) = 80x + 1000$
(b) $R(x) = 110x$
(c) $P(x) = 30x - 1000$
(d) (33.33, \$3666.67)
If they make and sell approx. 33 radios, then the revenue will equal the cost (\$3666.67) so the company will make no profit, but will also not lose money.
23. (a) $C(x) = 10x + 80000$
(b) $R(x) = 20x$
(c) $P(x) = 10x - 80000$
(d) (8000, \$160,000)
(e) $P(4000) = \$-40000$
 $P(8000) = \$0$
 $P(12000) = \$40000$
24. (a) $C(x) = 3.5x + 150$
(b) $R(x) = 75x$
(c) $P(x) = 71.5x - 150$
(d) Approx. (2.10, \$157.34)
25. $D(x) = -1.125x + 131.25$
26. (a) $D(x) = -0.75x + 24000$
(b) $S(x) = 20x + 13000$
27. 5 cents
28. $D(x) = -0.1x + 185$
29. (a) $D(x) = -0.0025x + 40$
(b) $S(x) = 0.0025x + 10$
(c) (6000, \$25)
30. (a) $y = 1.4649x + 0.2982$
(b) Yes, $|r| = 0.9972 > 0.8$

$$31. (a) AB = \begin{bmatrix} (5a + 2b + 3c) & (a + 4c) \\ (5d + 2e + 3f) & (d + 4f) \end{bmatrix}$$

(b) No Solution

$$32. (a) A^T = \begin{bmatrix} 1 & 5 \\ 4 & 6 \end{bmatrix}$$

$$(b) 2B = \begin{bmatrix} 2 & 6 \\ 4 & 8 \end{bmatrix}$$

$$(c) B + C = \begin{bmatrix} 6 & 9 \\ 9 & 12 \end{bmatrix}$$

$$33. (a) \begin{bmatrix} A & E & I & M \\ B & F & J & N \\ C & G & K & O \\ D & H & L & P \end{bmatrix}$$

$$(b) \begin{bmatrix} 1 & 3 & 2 \\ -2 & 4 & 3 \\ 3 & -2 & 7 \end{bmatrix}$$

34. No; it is not square (However, not all square matrices have inverses either.)

$$35. a = 11, b = -4.5, c = -2$$

$$36. (a) a = 2/3, b = -16/3, c = -8, d = -18$$

$$(b) a = 2, b = 2, c = 33, d = 9$$

$$(c) a = -8/3, b = -22/9, c = -25/9, d = -11/3$$

(a) No

(b) No

(a) No solution

$$(b) x = -1/3, y = 2/3, z = -8/3$$

(c) No solution

$$(d) x = 95/8, y = -35/16, z = -85/8$$

$$(e) x = 1, y = -1, z = 2, w = 2$$

$$(f) x = 2, y = 35/13, z = 28/13$$

$$(g) x = 18.75, y = 15, z = -3.75$$

$$(h) x = 7/6t + 13/6, y = -2/3t + 4/3, z = t$$

$$(i) x = 7.64, y = 6.18, z = 0.52$$

$$(j) x = 3, y = 7, z = 18$$

$$(k) x = 3/7, y = 19/7, z = 0$$

$$39. A = \begin{bmatrix} 300 & 600 & 900 \end{bmatrix} B = \begin{bmatrix} 128 \\ 13 \\ 57 \end{bmatrix}$$

AB = worth = \$97,500

$$40. A = \begin{bmatrix} 3 & 4 & 2 \end{bmatrix} B = \begin{bmatrix} 68 \\ 19 \\ 18 \end{bmatrix}$$

AB = cost = \$316

41. x = # heifers, y = # bulls, z = # calves

$$x + y + z = 20$$

$$x = y$$

$$z = x - 2$$

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ -1 & 0 & 1 \end{bmatrix} X = \begin{bmatrix} x \\ y \\ z \end{bmatrix} B = \begin{bmatrix} 20 \\ 0 \\ -2 \end{bmatrix}$$

$$x = 22/3, y = 22/3, z = 16/3$$

(This means that the problem really has no solution because you would have to be able to have parts of animals to satisfy the equations.)

42. 20 houses, 25 stores, and 30 schools

43. Not possible

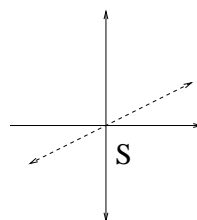
44. 3780 students and 220 faculty

45. 5 type A, 2 type B, and 4 type C

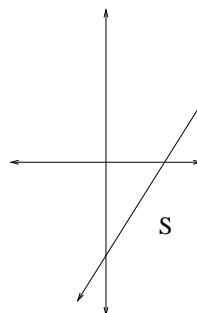
46. x = # of 80 lb, y = # of 60 lb, z = # of 180 lb

$$x = 53 - 6z, y = -29 + 5z, z = 6, 7, \text{ or } 8$$

47. S denotes the feasible region.

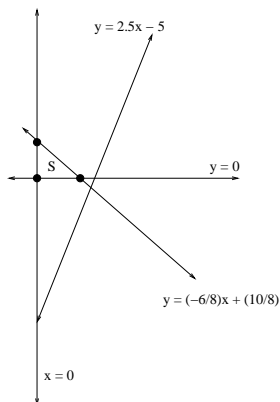


48. S denotes the feasible region.



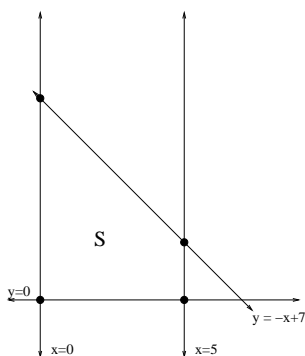
49. No, the feasible region is unbounded.

50. S denotes the feasible region.



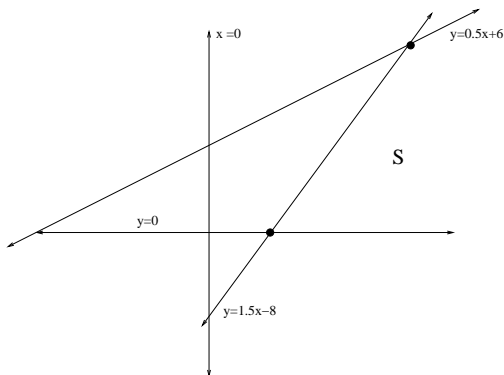
The region is bounded with corner points: $(0,0)$, $(0, 10/8)$, and $(10/6,0)$.

51. S denotes the feasible region.



The region is bounded with corner points: $(0,0)$, $(0,7)$, $(5,2)$, and $(5,0)$.

52. S denotes the feasible region.



The region is unbounded with corner points: $(16/3, 0)$ and $(14,13)$.

53. CPs: $(0,40)$, $(5,20)$, $(12,6)$, and $(30,0)$.
SOLN: Infinitely many solutions on the line segment connecting $(5,20)$ and $(12,6)$ minimize C at 90.

54. CPs: $(0,5)$, $(2,2)$, and $(4,0)$.
SOLN: $(0,5)$ minimizes C at 10.

55. CPs: See #53.
SOLN: $(12,6)$ minimizes C at 54.

56. CPs: $(3,3)$, $(5.4, 4.6)$, and $(1,9)$.
SOLN: $(1,9)$ maximizes P at 47.

57. CPs: $(0,30)$, $(0,36)$, $(6,32)$ and $(30,0)$.
SOLN: $(30,0)$ maximizes P at 150.

58. CPs: $(10,38)$, $(10,20)$, and $(37,11)$.
SOLN: $(10,38)$ maximizes P at 182.

59. CPs: $(0,25)$, $(15,17.5)$, $(25,5)$, and $(10,5)$.
SOLN: $(25,5)$ maximizes P at 85.

60. CPs: $(0,0)$, $(0,5.5)$, $(27/7,25/7)$, and $(6,0)$.
SOLN: P obtains a maximum of 33 at infinitely points on the line segment connecting $(0,5.5)$ and $(27/7,25/7)$.

61. Unbounded in the first quadrant, so P has no maximum.

62. CPs: $(0,18)$ and $(11,7)$.
SOLN: $(11,7)$ minimizes C at 118.

63. $(8,3)$ maximizes P at 78.

64. All the points on the line segment connecting $(3,6)$ and $(6,4)$ minimize P at 24.
All the points on the line segment connecting $(3,9)$ and $(6,7)$ maximize P at 33.

65. c = # of acres of cotton
 b = # of acres of lima beans

OBJ: Max $P = 250c + 150b$

SUBJ TO:

$$c + b \leq 220$$

$$1.5c + 2b \leq 175$$

$$2c + b \leq 50$$

$$c \geq 0, b \geq 0$$

66. e = # of english saddles
 w = # of western saddles

OBJ: Max $R = 350e + 600w$

SUBJ TO:

$$5e + 12w \leq 1100$$

$$12e + 16w \leq 256$$

$$2e + 4w \leq 42$$

$$e \geq 0, w \geq 0$$

67. (a) $x = \# \text{ of } A, y = \# \text{ of } B$
 CPs: (0,0), (0, 3333.33), (2500,0)
 SOLN: Max revenue is \$500,000 when 2500 A and none of B are produced.
- (b) $x = \# \text{ of large coats}, y = \# \text{ small coats}$
 CPs: (0,0), (0,10), (6,0)
 SOLN: Max revenue is \$550 when no large coats and 10 small coats are made.
- (c) $x = \# \text{ of "a" shipments}, y = \# \text{ of "b" shipments}$
 CPs: (0,0), (0,5), (2,4), (8/3, 0)
 SOLN: Max profit is \$20 when 2 shipments of "a" and 4 shipments of "b" are made.

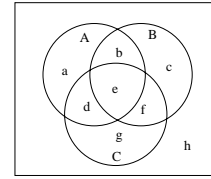
68. Basic: y, t, v, w, P
 Non-Basic: x, u
 Not in final form - pivot on the '1' in R4C4.

69. (a) Max $P = 21$ at (0,3,0).
 (b) Max $P = 60$ at (6,6).
 (c) Max $P = 18$ at (0,2).
 (d) Max $P = 596/3$ at (25/3, 14/3).
 (e) Max $P = 130/3$ at (0, 13/3, 0).
 (f) Max $P = 24$ at (3,4).
 (g) Max $P = 40$ at (0,10,0).

70. If there is a ** by the solution, it means that to make the answer a real-life answer the answers had to be rounded for the situation. Therefore, if you do simplex and get numbers close, but not exactly what are here, then check to see if you need to round.

- (a) Should make 20 of A and 20 of B to max profits at \$140.
- (b) ** Should make 0 Maxima's and 14 I-30s to max profits at \$245,000.
- (c) ** Should make 2 large bears and 7 small bears to max profits at \$159. There will be 8 buttons, 3 yards of fabric, and 355 g of fluff leftover.
- (d) ** Should make 26 floor lamps and no table lamps to max profits at \$650.
- (e) Should make no standard and 6 scientific calculators to max revenue at \$516.
- (f) Should make 120 small, 80 medium, and no large sheds to max profits at \$15,600.

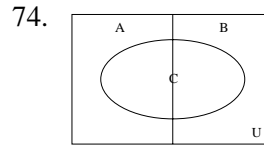
71. Refer to the following Venn diagram for the sections described.



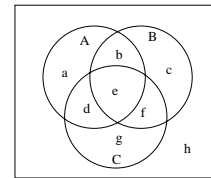
- (a) Sections b,e, and f.
 (b) Sections a,b, and h.
 (c) All sections but b.
 (d) Sections d,e, and f.
 (e) Sections a,b, and e.

72. $C \cap A^C$

73. $n(A \cap B) = 0, n(A \cap C) = 0$
 $n(A \cup B) = 104, n(A \cup C) = 107$



Refer to the following Venn diagram for answers 75-81.



75. A = basketball
 B = football
 C = baseball
 $a=10, b=13, c=21, d=8, e=3, f=10, g=19, h=16$
76. A = Chili's
 B = Hard Rock
 C = Snuffers
 $a=8, b=10, c=21, d=11, e=30, f=16, g=28, h=26$
77. A = pepperoni
 B = sausage
 C = olives
 $a=25, b=145, c=15, d=15, e=5, f=35, g=75, h=5$
78. A = Oklahoma
 B = Wyoming
 C = foreign country
 $a=40, b=60, c=33, d=25, e=27, f=30, g=15, h=70$

79. A = football
 B = baseball
 (Only two subsets - three sections a,b,c from left to right.)
 a=35, b=15, c=25

80. (a) A = Harry's
 B = Shadow Canyon
 C = The Chicken
 a=10, b=5, c=15, d=15, e=30, f=9, g=15, h=1
 (b) $B \cap A^C \cap C^C$

81. (a) A = A&M
 B = Texas Tech
 C = t.u.
 a=38, b=130, c=5, d=22, e=60, f=20, g=23, h=52
 (b) Shade sections b,d, and f.
 (c) $A \cap B^C \cap C^C$

82. (a) 120
 (b) 80
 (c) 80
 (d) 40
 (e) 60

83. (a) 1950
 (b) 785
 (c) 54

84. $4!2!2!2! = 384$

85. $9(10)^6 = 9,000,000$

86. $5^8 = 390,625$

87. (a) $(10)(10)(10) = 1000$
 (b) $(9)(9)(9) = 729$

88. (a) $10! = 3,628,800$
 (b) $(1)(9!) = 362,880$
 (c) $(1)(8!)(1) = 40,320$

89. $\frac{10!}{3!2!2!} = 151,200$

90. $C(12,3) = 220$

91. $C(100,8) - C(90,8) = 1.08 \times 10^{11}$

92. (a) $C(472,11) = 5.77 \times 10^{21}$
 (b) $C(263,6)C(209,5) = 1.37 \times 10^{21}$

93. $C(2,2)C(4,1)C(9,1) = 36$

94. $C(26,2)C(26,3) = 845,000$

95. 1/6

96. 2/52

97. (a) 1/52
 (b) 16/52
 (c) 26/52
 (d) 48/52

98. (a) 0.5
 (b) 0.4
 (c) 0.2

99. 0 and 1

100. (a) $\frac{C(1,1)C(4,2)}{C(10,3)} = 0.05$
 (b) $\frac{C(3,2)C(7,1)+C(3,3)}{C(10,3)} = 11/60$
 (c) $\frac{C(2,2)C(1,1)}{C(10,3)} = 1/120$

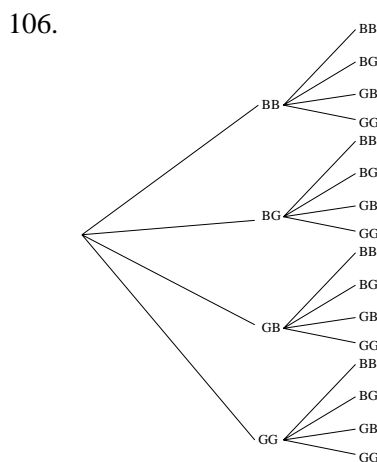
101. (a) 20/26
 (b) 6/26

102. (a) $\frac{C(2,1)C(48,6)}{C(50,7)} = 43/175$
 (b) $\frac{C(48,7)}{C(50,7)} = 129/175$

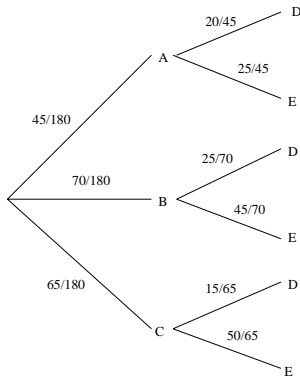
103. $\left[\frac{C(4,2)}{C(120,2)} \right] \left[\frac{C(10,1)}{C(200,1)} \right] \left[\frac{C(100,30)C(400,10)}{C(500,40)} \right]$

104. (a) 8/64
 (b) 28/64
 (c) 4/8

105. 4/11



107. $E = D^C$



108. $(2/4)(1/3) = 2/12$

109. $1/380$

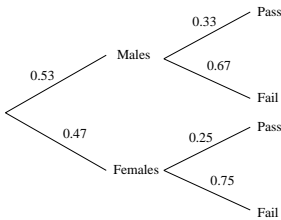
110. (a) $10/11$

(b) $1/11$

111. (a) 0.013

(b) 0.056

112. (a)



(b) 0.1175

(c) 0.5982

113. (a) $60/90$

(b) $20/60$

(c) $30/90$

(d) $10/30$

114. $1/3$

115. $28/53$

116. (a) $72/163$

(b) $4/27$

117. $4/36$

118. (a) X = amount of money made by a ringer

X	40	50	80	100	125	250	300
Prob.	0.1	0.2	0.1	0.3	0.1	0.1	0.1

(c) Mean = 119.5

Standard deviation = 82.6574

Variance = 6832.25

Grade	A	B	C	D	F
Prob.	$3/29$	$9/29$	$10/29$	$5/29$	$2/29$

120. -1.9692

121. 0.7 (Meaning you should probably expect 1 toy not to work.)

122. (a) \$0.80

(b) Not fair, $E(X) \neq 0$

123. \$-0.44

X	-8	24	40	56	72	88
Prob.	$1/36$	$1/36$	$1/36$	$1/36$	$1/36$	$1/36$
X	0	4	8	12	-5	-3
Prob.	$2/36$	$4/36$	$4/36$	$2/36$	$2/36$	$4/36$
X	-1	1	3			
Prob.	$6/36$	$4/36$	$2/36$			

(b) \$9.06

125. $2/5$

126. (a) $8/13$

(b) $5/13$

127. \$192

128. (a) \$450,000

(b) No

129. Mean = 2

Variance = 1

Standard deviation = 1

130. At least $5/9$

131. At least 0.91