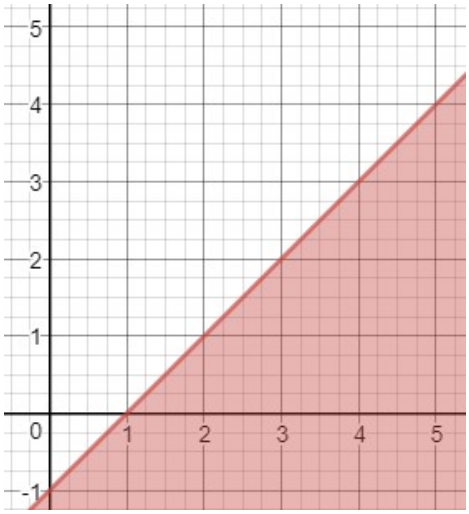
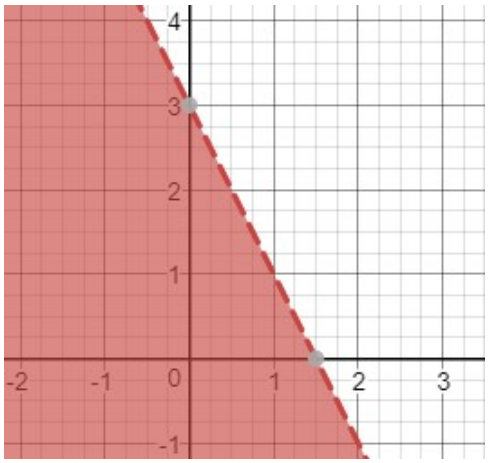
Chapter 4 Solutions

Section 4.1

Question 1 1)

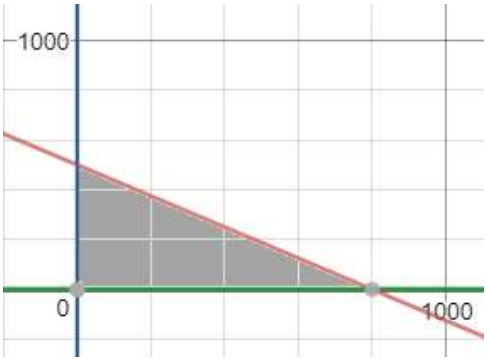


2)

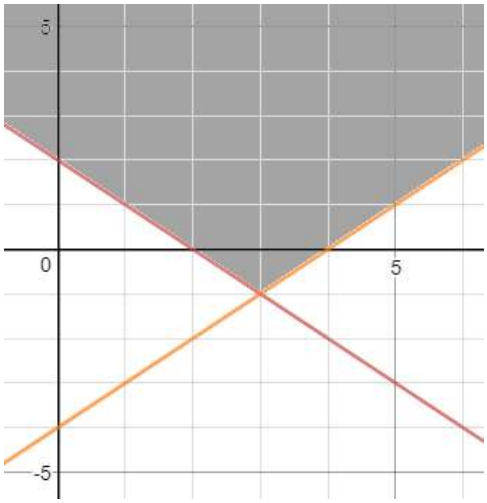


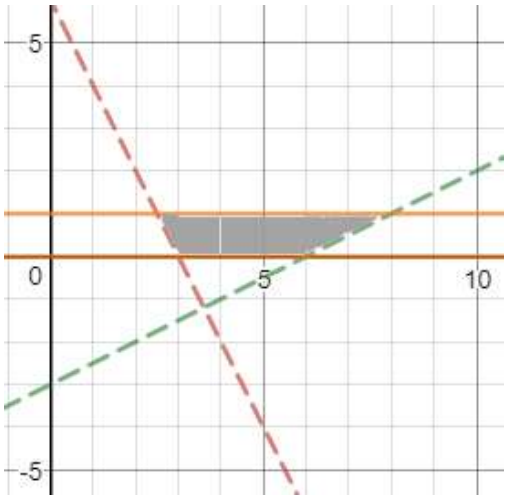
3)

4)

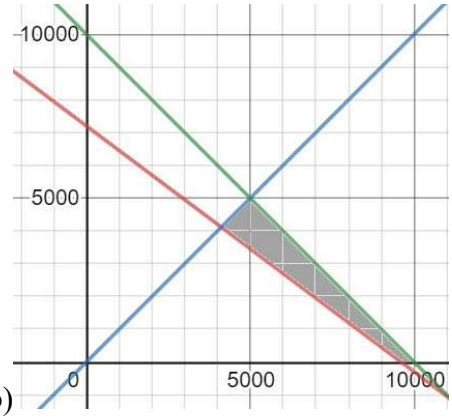


Question 2 1) 2)





3a) $x + y \le 10{,}000, .015x + .02y \ge 144, x \ge y, x \ge 0, y \ge 0$



3b)

Section 4.2

Question 1 1a) $z = 3x_1 + 4x_2$, 1b) $x_1 + x_2 \le 40, x_1 + 2x_2 \le 60$, 1c) $x_1 \ge 0, x_2 \ge 0$

Question 2 1) Maximum of 140 at (20, 20) 2) All points on the line connecting $\left(\frac{1}{2}, \frac{1}{2}\right)$ and $\left(\frac{3}{2}, 0\right)$ yield the same minimum value of $z = 1.5$.

Section 4.3

Question 1 1) Yes

Question 2 1)
$$\begin{array}{c} x_1 \quad x_2 \quad s_1 \quad s_2 \quad z \\ \left[\begin{array}{ccccc|c} 1 & 1 & 1 & 0 & 0 & 140 \\ 1 & 2 & 0 & 1 & 0 & 60 \\ \hline -3 & -4 & 0 & 0 & 1 & 0 \end{array}\right] \end{array}$$

Question 3 1) $x_1 = 20, x_2 = 0, s_1 = 40, s_2 = 0, z = 120$

Question 4 1) $x_1 = 20, x_2 = 20, z = 140$

Question 5 1) The linear programming problem Maximize $P = 0.6G + 0.76C + 0.99M$ subject to $G \le 100$, $G + C + M \le 400$, $2M \le C$ with $G \ge 0, C \ge 0, M \ge 0$ has a solution $G = 0, C = 266\frac{2}{3}, M = 133\frac{1}{3}$.

Section 4.4

Question 1 1) Minimize $w = .06y_1 + .04y_2 + .02y_3$ subject to $y_1 + y_2 + y_3 \ge 1000$, $\frac{1}{2}y_2 - y_3 \ge 0$, $-0.5y_1 + y_2 - 0.5y_3 \ge 0$ with $y_1 \ge 0, y_2 \ge 0, y_3 \ge 0$

Question 2 1) Maximize $z = x_1 + 3x_2$ subject to $x_1 + 2x_2 \le 2$, $x_1 + 4x_2 \le 1$ with $x_1 \ge 0, x_2 \ge 0$

Question 3 1) $y_1 = 4, y_2 = 1, w = 48$

Question 4 1) The linear programming problem Minimize $w = 8y_1 + 12y_2 + 10y_3$ subject to $2.5y_1 + 4.5y_2 + 5y_3 \ge 54$, $5y_1 + 3y_2 + 10y_3 \ge 60$ with $y_1 \ge 0, y_2 \ge 0, y_3 \ge 0$ has solution $y_1 = 0, y_2 = 0, y_3 = 10.8, w = 108$.