Section 1.3

③ $\begin{cases} x - 4y = -2 \\ x + 2y = 4 \end{cases}$

$x - 4y = -2$

$-4y = -x - 2$

$y = \frac{-x}{-4} + \frac{-2}{-4}$

$y = \frac{x}{4} + \frac{1}{2}$

$x + 2y = 4$

$2y = -x + 4$

$y = -\frac{x}{2} + 2$

$y = y$

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

Multiply by 4: $x + 2 = -2x + 8$

$3x = 6$

$x = 2$

$x = 2 \rightarrow$ either equation

$x = 2 \rightarrow \quad x + 2y = 4$

$2 + 2y = 4$

$2y = 2$

$y = 1$

$(x, y) = (2, 1)$

(5)

$$\begin{cases} y = \frac{1}{3}x - 1 \\ x = 12 \end{cases}$$

$x = 12 \rightarrow \quad y = \frac{1}{3}x - 1$

$$y = \frac{12}{3} - 1$$

$$y = 4 - 1$$

$$y = 3$$

$$(x, y) = (12, 3)$$

⑨ $\begin{cases} 2x+y=7 \\ x-y=3 \end{cases}$

$2x+y=7$

$y=-2x+7$

$x-y=3$

$-y=-x+3$

$y=x-3$

$y=y$

$-2x+7=x-3$

$-3x=-10$

$x=\frac{-10}{-3}=\frac{10}{3}$

$x=\frac{10}{3} \rightarrow \quad x-y=3$

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

$-y=3-\frac{10}{3} \quad \leftarrow \quad \frac{9}{3}-\frac{10}{3}$

$-y=-\frac{1}{3}$

$y=\frac{1}{3}$

$(x,y)=\left(\frac{10}{3},\frac{1}{3}\right)$

(11)

$$\begin{cases} 5x - 2y = 1 \\ 2x + y = -4 \end{cases}$$

$5x - 2y = 1$

$-2y = -5x + 1$

$y = \frac{-5x}{-2} + \frac{1}{-2}$

$y = \frac{5x}{2} - \frac{1}{2}$

$2x + y = -4$

$y = -2x - 4$

$y = y$

$\frac{5x}{2} - \frac{1}{2} = -2x - 4$

Multiply by 2: $5x - 1 = -4x - 8$

$9x = -7$

$x = -\frac{7}{9}$

$x = -\frac{7}{9} \rightarrow \quad 2x + y = -4$

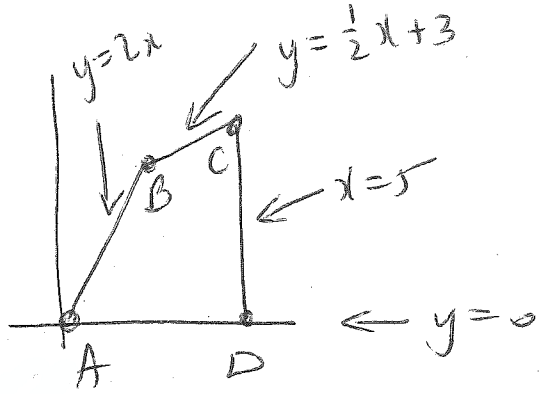
$-\frac{14}{9} + y = -4$

$y = -4 + \frac{14}{9} \quad \leftarrow \quad -\frac{36}{9} + \frac{14}{9}$

$y = -\frac{22}{9}$

$(x, y) = \left(-\frac{7}{9}, -\frac{22}{9}\right)$

(15)



$A = (0,0)$

$D = (5,0)$

B: $\begin{cases} y = 2x \\ y = \frac{1}{2}x + 3 \end{cases}$

$y = y$

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

Multiply by 2: $4x = 1x + 6$

$3x = 6$

$x = 2$ $\quad x = 2 \rightarrow y = 2x$, $y = 4$

$B = (2,4)$

C: $\begin{cases} y = \frac{1}{2}x + 3 \\ x = 5 \end{cases}$

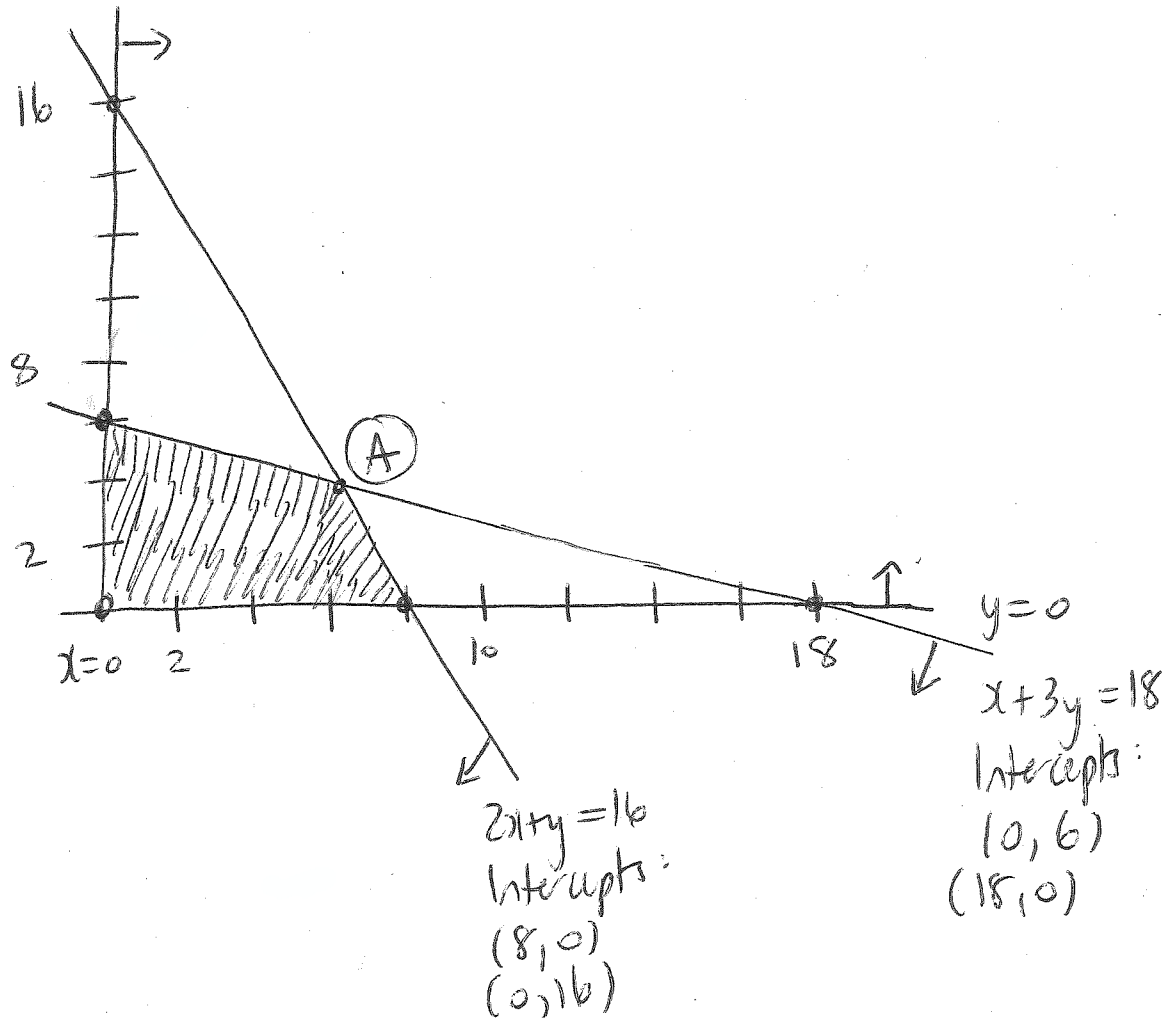
$x = 5 \rightarrow y = \frac{1}{2}x + 3$

$y = \frac{5}{2} + 3 \leftarrow \frac{5}{2} + \frac{6}{2}$

$y = \frac{11}{2}$

$C = (5, \frac{11}{2})$

(19)



3 of the vertices can be found from the graph:

$(0,0)$, $(0,6)$, $(8,0)$

$$A: \begin{cases} 2x+y=16 \\ x+3y=18 \end{cases}$$

$2x+y=16$

$y=16-2x$

$x+3y=18$

$3y=-x+18$

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

$y=y$

$16-2x=-\frac{x}{3}+6$ →

(19) Cont'd

$$16 - 2x = -\frac{x}{3} + 6$$

Multiply by 3: $48 - 6x = -x + 18$

$$30 = 5x$$

$$6 = x$$

$x = 6 \rightarrow \quad 2x + y = 16$

$$12 + y = 16$$

$$y = 4$$

$$A = (6, 4)$$

The vertices are: $(0,0), (0,6), (8,0), (6,4)$.

(25)

$$\begin{cases} p = 0.0001q + 0.05 \\ p = -0.001q + 32.5 \end{cases}$$

$$p = p$$

$$0.0001q + 0.05 = -0.001q + 32.5$$

$$0.0001q + 0.001q = 32.5 - 0.05$$

$$0.0011q = 32.45$$

$$q = \frac{32.45}{0.0011} = 29500$$

$q = 29500 \rightarrow$ $p = 0.0001q + 0.05$

$p = 0.0001\,(29500) + 0.05$

$p = 3$

The equilibrium quantity is $q = 29500$ units and the equilibrium price is $p = \$3$.

(31)

First Manufacturer: $y = mx + b$

m: Cost per unit (marginal cost)

b: fixed cost

$$y = 30x + 1200$$

Second Manufacturer: $y = 35x + 500$

$$y = y$$
$$30x + 1200 = 35x + 500$$
$$700 = 5x$$
$$x = \frac{700}{5} = 140$$

$x = 140 \rightarrow y = 30x + 1200$

$y = 30(140) + 1200$

$y = 5400$

The two manufacturers both charge \$5400 to produce 140 shirts.

Optional graph to help you visualize the problem: