Math 170 (Spring 2008)

Solutions for Some Problems in Homework #6

Section 3.1: 21, 22, 25, 26, 29, 32, 39, 40

Prob. 21: See solution in the book. The corner is $(1.5, -0.5)$

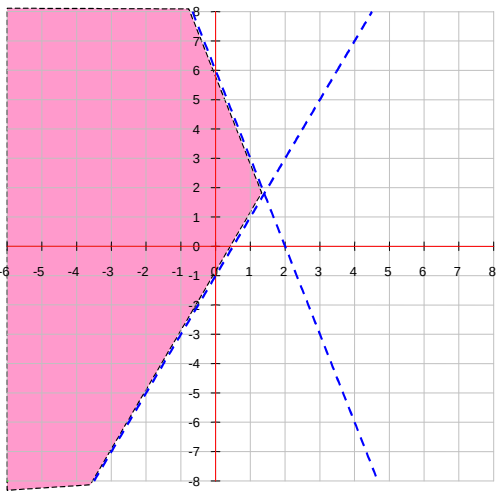
Prob. 22:

$$\begin{cases} 2x - y < 1 \\ 3x + y < 6 \end{cases}$$

To find the corner, solve the system

$$\begin{cases} 2x - y = 1 \\ 3x + y = 6 \end{cases}$$

Adding the two equations gives $5x = 7$, so $x = 7/5 = 1.4$. Substituting back into the second equation gives $3(7/5) + y = 6$, so $y = 1.8$. The corner shown is thus $(1.4, 1.8)$



Prob. 25: See solution in the book. The two corners are $(0.2, -4.8)$ and $(-\frac{8}{3}, \frac{20}{3}) = (-2\frac{2}{3}, 6\frac{2}{3})$.

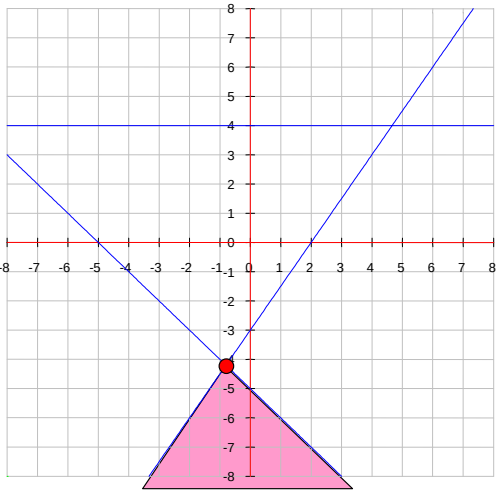
Prob. 26:

$$\begin{cases} 3x - 2y \geq 6 \\ x + y \leq -5 \\ y \leq 4 \end{cases}$$

The corner shown is where the line $3x - 2y = 6$ meets the line $x + y = -5$. Solve the system

$$\begin{cases} 3x - 2y = 6 \\ x + y = -5 \end{cases}$$

to get $x = -4/5 = -0.8$ and $y = -4.2$. Thus the corner is located at $(-0.8, -4.2)$



Prob. 29: See solution in the book.

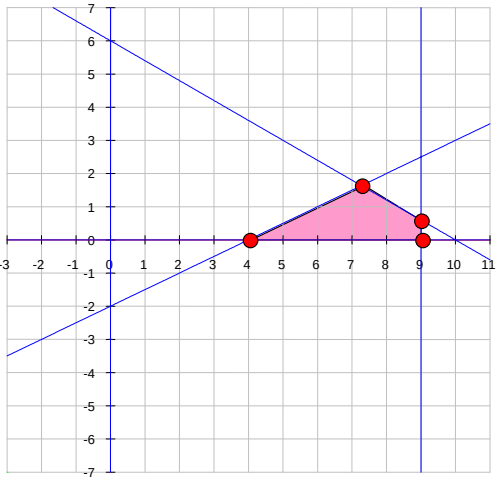
Prob. 32:

$$\begin{cases} 0 \leq x \leq 9 \\ x - 2y \geq 4 \\ 3x + 5y \leq 30 \\ y \geq 0 \end{cases}$$

The four corners are $(4, 0)$, $(9, 0)$, $(9, 0.6)$, and $(\frac{80}{11}, \frac{18}{11}) = (7\frac{3}{11}, 1\frac{7}{11})$. They are respectively, the solutions of the following four systems:

$$\begin{cases} x - 2y = 4 \\ y = 0 \end{cases} \qquad \begin{cases} x = 9 \\ y = 0 \end{cases} \qquad \begin{cases} x = 9 \\ 3x + 5y = 30 \end{cases}$$

and $\begin{cases} x - 2y = 4 \\ 3x + 5y = 30 \end{cases}$



Prob. 39:

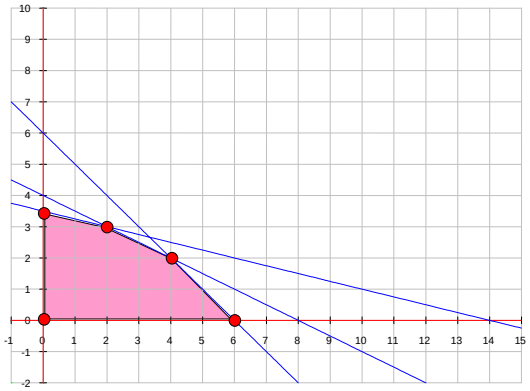
(a)

	Shawls	Afghans	Total
Number Made	x	y	
Spinning Time (hr)	1	2	≤ 8
Dyeing Time (hr)	1	1	≤ 6
Weaving Time (hr)	1	4	≤ 14

(b)

$$\begin{cases} x + 2y \le 8 \\ x + y \le 6 \\ x + 4y \le 14 \end{cases}$$

with $x \ge 0$, $y \ge 0$



The origin $(0, 0)$ is a corner.

The corner on the positive y-axis is the y-intercept $(0, 7/2)$ of $x + 4y = 14$.

The corner on the positive x-axis is the x-intercept $(6, 0)$ of $x + y = 6$.

Another corner satisfies $\begin{cases} x + 2y = 8 \\ x + y = 6 \end{cases}$, and so is $(4, 2)$.

The last corner satisfies $\begin{cases} x + 2y = 8 \\ x + 4y = 14 \end{cases}$, and so is $(2, 3)$.

(c) Yes, "3 shawls and 2 afghans" is feasible.
No, "4 shawls and 3 afghans" is not feasible.

Prob. 40: Let $x =$ the number of barrels of oil sent to distributor 1.
Let $y =$ the number of barrels of oil sent to distributor

(a)

$$\begin{cases} x \ge 3000 \\ y \ge 5000 \\ x + y \le 10000 \end{cases}$$

(b)