Assignment #19

19 4.3 p 323 # 2, 6, 10, 12, 14, 16, 22, 38

2. $f = 6x + 2y$
At (0, 2), $f = 4$
At (3, 4), $f = 26$
At (5, 3), $f = 36$
At (7, 0), $f = 42$ ← maximum

6. $C = 4x + 7y$
At (3, 1), $C = 19$ ← minimum
At (8, 6), $C = 74$ ← maximum
At (4, 5), $C = 51$
At (1, 3), $C = 25$

10. Maximize $f = 5x + 8y$
From the graph we read the intercept corners (0, 0), (0, 40), and (35, 0).

$$\begin{array}{r} 4x + y = 140 \\ \underline{x + y = 50} \\ 3x = 90 \\ x = 30 \\ y = 20 \end{array} \qquad \begin{array}{r} x + 2y = 80 \\ \underline{x + y = 50} \\ y = 30 \\ x = 20 \end{array}$$

Corners: (30, 20) and (20, 30)
At (0, 0), $f = 0$
At (0, 40), $f = 320$
At (35, 0), $f = 175$
At (30, 20), $f = 310$
At (20, 30), $f = 340$ ← maximum

12. Minimize $g = x + 3y$
From the graph we read the intercept corners (0, 45) and (50, 0).

$$\begin{array}{r} 3x + y = 45 \\ \underline{x + y = 35} \\ 2x = 10 \\ x = 5 \\ y = 30 \end{array} \qquad \begin{array}{r} x + 2y = 50 \\ \underline{x + y = 35} \\ y = 15 \\ x = 20 \end{array}$$

Corners: (5, 30) and (20, 15)
At (0, 45), $g = 135$
At (50, 0), $g = 50$ ← minimum
At (5, 30), $g = 95$
At (20, 15), $g = 65$

14. Refer to Problem 22 in Section 4.2 to obtain the corners. Maximize $f = 2x + y$

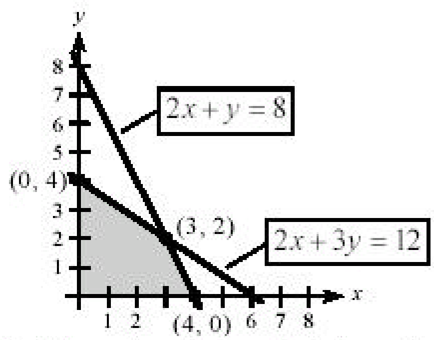
Corners (0, 0), (2, 4), (4, 3), (5, 0), (0, 2)
At (0, 0), $f = 0$
At (2, 4), $f = 8$
At (4, 3), $f = 11$ ← maximum
At (5, 0), $f = 10$
At (0, 2), $f = 2$

16. Refer to Problem 24 in Section 4.2 to obtain the corners. Maximize $f = 7x + 10y$

Corners: (0, 0), (0, 4), (2, 3), (3, 0)
At (0, 0), $f = 0$
At (0, 4), $f = 40$
At (2, 3), $f = 44$ ← maximum
At (3, 0), $f = 21$

22. Maximize $f = 3x + 2y$

Corners: (0, 4), (3, 2), (4, 0), (0, 0)
Read from the graph below.
At (0, 4), $f = 8$
At (3, 2), $f = 13$ ← maximum
At (4, 0), $f = 12$
At (0, 0), $f = 0$



38. If x is the number of mice and y is the number of rabbits, we want to maximize $f = x + y$. The corners, from problem 32, Section 4.2 are $\left(0, \frac{100}{3}\right), \left(\frac{20}{3}, \frac{260}{9}\right)$, (24, 0), (0, 0). At these corners the values of f are $\frac{100}{3}$, $\frac{320}{9}$, 24 and 0 respectively. The maximum occurs at $\left(\frac{20}{3}, \frac{260}{9}\right)$. Fractional parts have no meaning in this context. Using the greatest integer function, the number of mice that can be used is 6 and the number of rabbits is 28. However, this frees up enough time to add one or the other of these. So, either 7 mice and 28 rabbits or 6 mice and 29 rabbits should be used for a maximum of 35 animals.