Assignment #20

20 4.3 p 323 # 4, 8, 18, 20, 26, 40, 42

4. $f = 6x + 4y$

At (0,0), $f = 0$ ← minimum

At (7,0), $f = 42$

At (6,2), $f = 44$ ← maximum

At (4,4), $f = 40$

At (0,5), $f = 20$

8. $f = 4x + 5y$

At (8, 0), $f = 32$
At (4, 1), $f = 21$
At (2, 2), $f = 18$ ← minimum
At (0, 6), $f = 30$
No maximum, unbounded region.

18. Refer to Problem 26 in Section 4.2 to obtain the corners. Minimize $g = 5x + 2y$

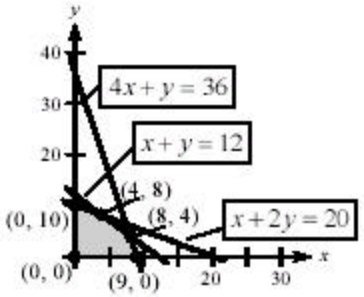
Corners (0, 12), (1, 8), (6, 3), (15, 0)
At (0, 12), $g = 24$
At (1, 8), $g = 21$ ← minimum
At (6, 3), $g = 36$
At (15, 0), $g = 75$

20. Refer to Problem 28 in Section 4.2 to obtain the corners. Minimize $g = 12x + 8y$

Corners: (0, 11), (2, 7), (8, 1), (10, 0)
At (0, 11), $g = 88$
At (2, 7), $g = 80$ ← minimum
At (8, 1), $g = 104$
At (10, 0), $g = 120$

26. Maximize $f = 4x + 2y$

Corners: (0, 0), (0, 10), (4, 8), (8, 4), (9, 0)
At (0, 0), $f = 0$
At (0, 10), $f = 20$
At (4, 8), $f = 32$
At (8, 4), $f = 40$ ← maximum
At (9, 0), $f = 36$



40. From the graph of Problem 34, Section 4.2 the corners are (0, 120), (110, 120), (130, 100), (130, 0) and (0, 0).

Corner	$S = x + 2y$	
(0, 120)	240	
(110, 120)	350	← Maximum sales of \$350 are obtained by selling 110 fender bolts and 120 bumper bolts.
(130, 100)	330	
(130, 0)	130	
(0, 0)	0	

42. x = small lifts produced each day
y = large lifts produced each day
Objective function: $P = 25x + 50y$

$\frac{3}{4}x + \frac{3}{2}y \le 156$ Welding and assembly

$\frac{5}{3}x + y \le 174$ Parts and packaging

$x \le 100$ Demand for small lifts

$y \le 90$ Demand for large lifts

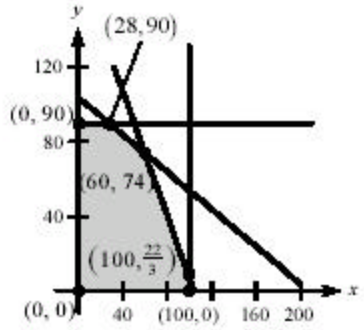
$\frac{3}{4}x + \frac{3}{2}y = 156 \rightarrow \quad 5x + 10y = 1040$

$\frac{5}{3}x + y = 174 \rightarrow \quad -5x - 3y = -522$

$7y = 518$

$y = 74$

$x = 60$



Corner	$P = 25x + 50y$
$(0,0)$	0
$(0,90)$	4500
$(28,90)$	5200
$(60,74)$	5200
$(100,\frac{22}{3})$	2866.7
$(100,0)$	2500

Maximum profit occurs at two corners, so it will occur at every boundary point connecting the two corners. Hence $28 \le x \le 60$ and $y = 104 - \frac{1}{2}x$.