Math 1300 Fall 2013
Quiz 3
Friday October 4 2013
No Work = No Credit

Name: _____ **Student Number:** _____

Signature: _____

Instructor: _____ **Section:** _____

Instructions: Answer all questions and show all of your work.

Problem	Points	Student's Score
1	10	
Total:	10	

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1. A lawn mower factory manufactures push mowers and riding mowers. Due to existing contracts with retailers, each day, the factory must produce at least 20 push mowers and at least 15 riding mowers. Retail demand is moderate and the company can only sell at most 90 total mowers per day.

   The factory is large enough to produce at most 60 push mowers and at most 40 riding mowers on a daily basis. In addition, to prevent layoffs, the factory must produce at least 50 total mowers each day.

   Suppose each push mower produces $45 in profit and each riding mower produces $55 in profit. Answer the questions below to determine the optimal manufacturing mix of push and riding mowers which maximizes the factory's profit.

   (a) (4 points) Let x represent the number of push mowers to be produced and let y represent the number of riding mowers to be produced. Write linear inequalities in x and y for each of the constraints described above.

   Solution:

   $$\boxed{x \geq 20}$$

   $$\boxed{y \geq 15}$$

   $$\boxed{x + y \leq 90} \longrightarrow y \leq -x + 90$$

   $$\boxed{x \leq 60}$$

   $$\boxed{y \leq 40}$$

   $$\boxed{x + y \geq 50} \longrightarrow y \geq -x + 50$$

   (b) (1 point) Let P represent the factory's daily profit. Write a formula for P in terms of x and y.
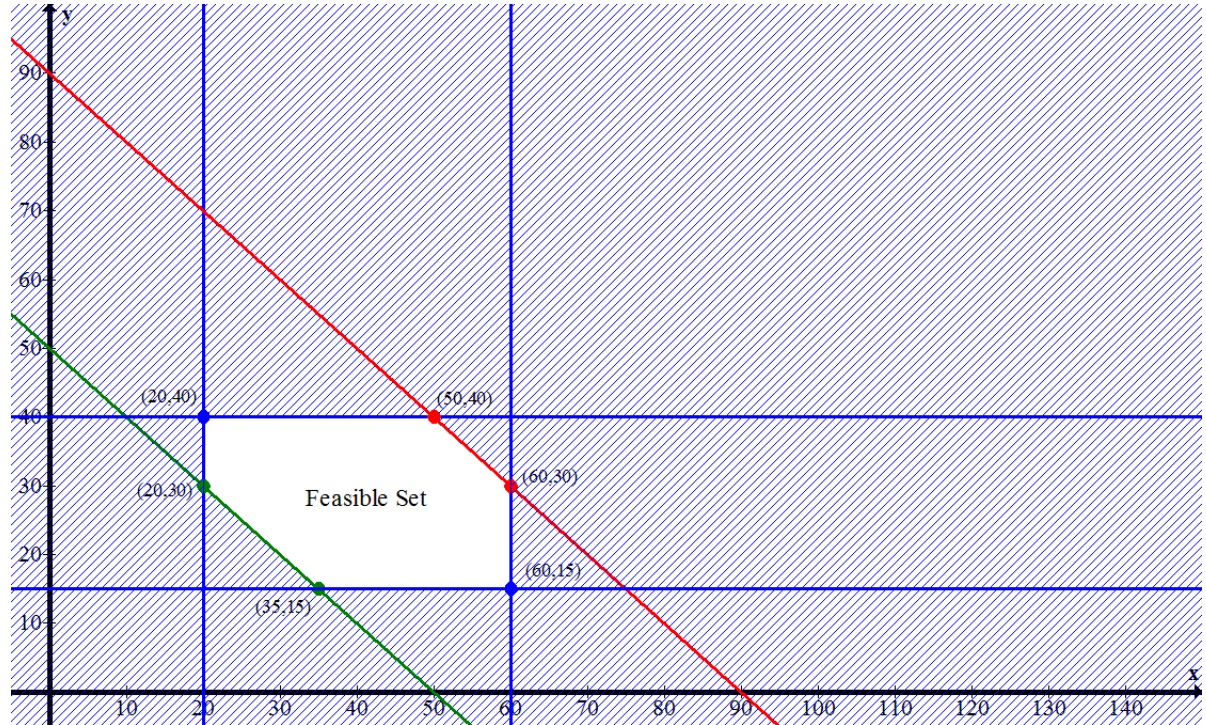

   Solution:

   $$\boxed{P = 45x + 55y} \tag{1}$$

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(c) (2 points) Graph the inequalities associated with this problem and identify the feasible set.

(d) (2 points) Find the vertices of the feasible set.

> **Solution:** See diagram.

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(e) (1 point) Evaluate the factory's daily profit function at each vertex and identify the optimal manufacturing mix. State your answer in terms of the number of push mowers and riding mowers to be produced.

Solution:

$$(20, 40): \ 45(20) + 55(40) \tag{2}$$

$$(50, 40): \ 45(50) + 55(40) = \boxed{\$4450} \tag{3}$$

$$(60, 30): \ 45(60) + 55(30) = \$4350 \tag{4}$$

$$(60, 15): \ 45(60) + 55(15) \tag{5}$$

$$(35, 15): \ 45(35) + 55(15) \tag{6}$$

$$(20, 30): \ 45(20) + 55(30) \tag{7}$$

The manufacturing mix that maximizes the factory's profit is the production of 50 Push mowers and 40 Riding mowers per day.

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