DEPARTMENT OF MATHEMATICS

Ma 162 Second Exam October 15, 2012

Instructions: No cell phones or network-capable devices are allowed during the exam. You may use calculators, but you must show your work to receive credit. If your answer is not in the box or if you have no work to support your answer, you will receive no credit. The test has been carefully checked and its notation is consistent with the homework problems. No additional details will be provided during the exam. You are graded not on what you know, but on what you write on this exam. Be sure to communicate your understanding, not just write down the final answer.

Problem	Maximum Score	Actual Score
1	5	
2	5	
3	5	
4	5	
5	5	
6	5	
7	15	
8	15	
9	20	
10	20	
Total	100	

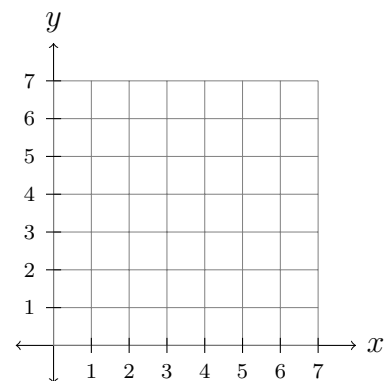NAME: _____ Section: _____

Last four digits of Student ID: _____

1. Is $(x = 3, y = 1)$ on the correct side of $20x + 40y \leq 10$? Explain why or why not.

2. Is $(x = 3, y = 1)$ a feasible solution to "maximize $P = 1.50x+2.00y$ subject to $3x+2y \leq 15$, $2x + 3y \leq 12$, $x \geq 0$, $y \geq 0$"? Is it optimal? Explain why or why not.

3. What are the corners of the feasible region described by $3x + 2y \leq 15$, $2x + 3y \leq 12$, $x \geq 0$, $y \geq 0$? Make sure to show at least one full calculation.

Problems 4,5,6 refer to this simplex tableau:

$$
\left(
\begin{array}{ccc|ccccc|c}
\mathbf{x} & \mathbf{y} & \mathbf{z} & \mathbf{a} & \mathbf{b} & \mathbf{c} & \mathbf{d} & \mathbf{P} & \textbf{RHS} \\
-5 & 0 & 3 & 0 & 2 & 1 & 0 & 0 & 33 \\
4 & 1 & 2 & 0 & 3 & 0 & 0 & 0 & 21 \\
3 & 0 & 1 & 1 & 4 & 0 & 0 & 0 & 10 \\
2 & 0 & 0 & 0 & 5 & 0 & 1 & 0 & 44 \\
\hline
1 & 0 & -1 & 0 & -6 & 0 & 0 & 1 & 55
\end{array}
\right)
$$

4. (a) What is the basic solution indicated by this simplex tableau?

(b) Explain why it is feasible, but not optimal.

5. (a) Which columns in this simplex tableau are eligible for pivoting?

(b) What happens if you pivot on a wrong column?

6. (a) Assuming we pivot the third column, which rows are eligible for pivoting?

(b) What happens if you pivot on a wrong row?

7. Do the row ops to pivot on the 3rd column, 3rd row, even if this is not the right row or column.

x	y	z	a	b	c	d	P	RHS
−5	0	3	0	2	1	0	0	33
4	1	2	0	3	0	0	0	21
3	0	1	1	4	0	0	0	10
2	0	0	0	5	0	1	0	44
1	0	−1	0	−6	0	0	1	55

8. Maximize $P = 1.50x + 2.00y$ subject to $5x + y \le 40$, $x + y \le 10$, $x + 5y \le 30$, $x \ge 0$, $y \ge 0$ Make sure to (1) shade the region, (2) label the corners, (3) label where the maximum occurs and how big it is, and (4) why it must be the maximum.
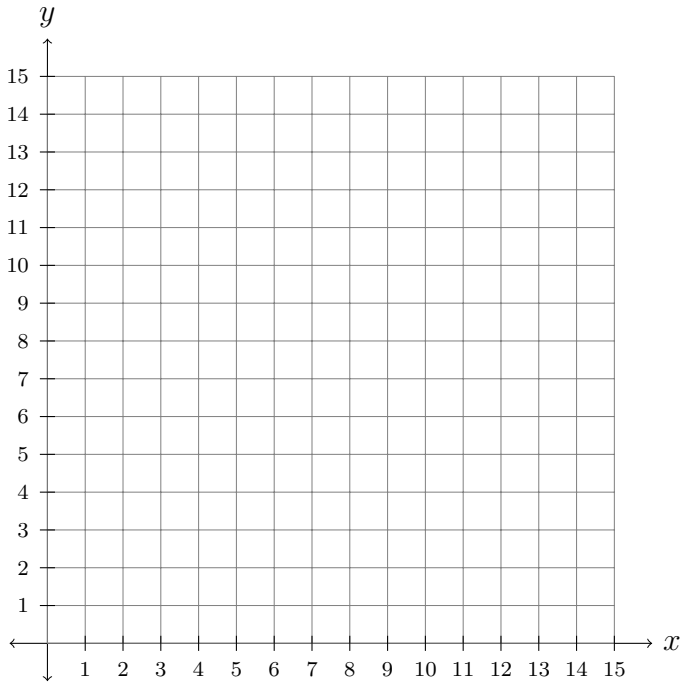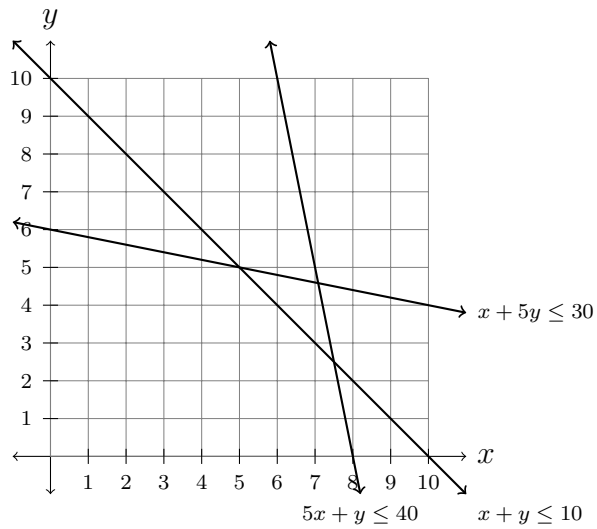
9. Vincent is trying to maximize profit using his limited resources. He has four limited resources: 24 tubes of Amarillo paint, 30 tubes of Berry red paint, 13 Canvases, and 33 tubes of Dark blue paint. He only knows how to paint two things: Sunshine and Lollipops, but he can sell as many as he can paint, earning a profit of $10 per Sunshine painting and $12 per Lollipops painting. Each painting requires a few tubes of paint:

	Amarillo	Berry Red	Canvases	Dark Blue	Profit
Sunshine	3	3	1	1	10
Lollipops	1	2	1	3	12
Inventory	24	30	13	33	

Give a recommendation to maximize his profit using only his limited resources:

Number of Sunshine paintings:	Bottom line Profit:
Number of Lollipops paintings:	
Leftover tubes of Amarillo paint:	
Leftover tubes of Berry red paint:	
Leftover Canvases:	
Leftover tubes of Dark blue paint:	

10. Vincent is trying to maximize profit using his limited resources and his brilliant new painting. He has four limited resources: 27 tubes of Amarillo paint, 30 tubes of Berry red paint, 10 Canvases, and 30 tubes of Dark blue paint. He now knows how to paint **three** things: Sunshine, Lollipops, and Rainbows Everywhere, and he can sell as many as he can paint, earning a profit of $10 per Sunshine painting, $12 per Lollipops painting, and an impressive $15 per Rainbows Everywhere painting. Each painting requires a few tubes of paint:

	Amarillo	Berry Red	Canvases	Dark Blue	Profit
Sunshine	3	3	1	1	10
Lollipops	1	2	1	3	12
Rainbows	2	2	1	3	15
Inventory	24	30	10	33	

Hint: When choosing a pivot column, in this case try the book's advice of choosing the most (immediately) profitable column first.

Which paintings should Vincent produce to maximize his profit using his limited resources?