Show all work.
Simplify your answer.
Circle your answer.

No books, no calculators, no cell phones, no pagers, no electronic devices of any kind.

Name_____

Circle your Discussion Section:

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343  T   12:05--12:55        1412 STERLING
344  R   12:05--12:55        1327 STERLING
345  T   13:20--14:10        1327 STERLING
346  R   13:20--14:10        1327 STERLING
```

Problem	Points	Score
1	10	
2	12	
3	12	
4	12	
5	12	
6	12	
Total	70	

Solutions will be posted shortly after the exam: www.math.wisc.edu/∼miller/m210

1. (10 pts) Let A and B be subsets of a universal set U. Suppose $n(U) = 50$, $n(B) = 30$ and $n(A \cup B') = 30$. Find $n(A \cap B)$.

2. (12 pts) Let

$$A = \begin{bmatrix} 2 & -1 & 1 \end{bmatrix} \qquad \text{and} \qquad B = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$$

(a) Find AB or state that it is an undefined product

(b) Find BA or state that it is an undefined product

3. (12 pts) A set F is described the inequalities

$$3y + x \leq 14$$

$$3y - 4x + 26 \geq 0$$

$$x \geq 2$$

Graph the set F and find the coordinates of the corner points.

4. (12 pts) Jane's Juicy Fruit Stand sells two kinds of fruit drinks, Tangaid and Pungaid. One glass of Tangaid contains 5 ounces of orange juice and 3 ounces of lemon juice. One glass of Pungaid contains 2 ounces of orange juice and 6 ounces of lemon juice. Jane has available 200 ounces of orange juice and 360 ounces of lemon juice. Her profit is 50 cents per glass of Tangaid and 40 cents per glass of Pungaid. How many glasses of each kind should she produce to maximize her profit?

5. (12 pts) A Markov chain has the following transition matrix:

$$\begin{bmatrix} .4 & .1 & .5 \\ .1 & .1 & .8 \\ .6 & .2 & .2 \end{bmatrix}$$

On the first observation it is in state 1.

(a) What is the probability it is in state 1 on the second observation?

(b) What state is it most likely to occupy on the second observation?

6. (12 pts) A not-so-enthusiastic student tends to miss class on Friday afternoons. She is always in one of two states, absent A or present P, and transitions occur according to the matrix:

	A	P
A	.3	.7
P	.6	.4

If the student is absent on a given Friday afternoon, find the probability she will be present 2 weeks latter.

Answers

1. 10

2.
(a) -1 or $[-1]$
(b)

$$\begin{bmatrix} 2 & -1 & 1 \\ 4 & -2 & 2 \\ -2 & 1 & -1 \end{bmatrix}$$

3. F is the interior and boundaries of the triangle with corners $(2,-6),(8,2),(2,4)$.

4. 20 Tangaid and 50 Pungaid.

5. (a) .4 (b) state 3

6. .49