

Name: _____

TA: George Brown Stefan Mueller
 Gabriel Pretel Mehmet Sengun

I	20 Points	
II	20 Points	
III	20 Points	
IV	20 Points	
V	20 Points	
Total	100 Points	

$$V = \frac{Y}{k} \left[1 - \frac{1}{(1+k)^n} \right], S = \frac{Y}{k} [(1+k)^n - 1], I = Prt, A = P(1+rt)$$

$$APY = 100 \left[\left(\frac{A}{P} \right)^{\frac{1}{t}} - 1 \right], A_n = P(1+k)^n$$

1. Write your name on every answer sheet.
2. Show your reasoning. You need to show work to get full credit.
3. Circle your final answers.

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I. (20 points.)

(A) Decide if the following matrices represent an absorbing Markov Chain. Back up your answer. If your answer is yes, identify absorbing state(s).

$$P = \begin{bmatrix} .5 & .5 & 0 & 0 \\ .2 & .8 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & .1 \end{bmatrix} \quad \text{Absorbing? Why?}$$

If, yes what are the absorbing state(s)?

$$Q = \begin{bmatrix} .2 & .3 & .5 & 0 \\ .1 & .1 & .2 & .6 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad \text{Absorbing? Why?}$$

If, yes what are the absorbing state(s)?

(B) Is $\begin{bmatrix} 0 & 1 \\ .3 & .7 \end{bmatrix}$ the transition matrix of a regular Markov chain? Justify your answer.

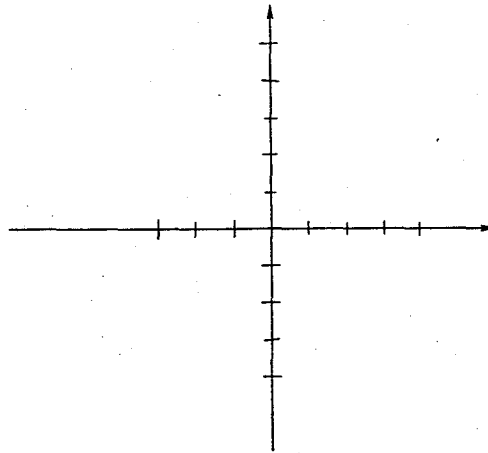
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II. (20 points.)

(A) Graph the feasible set according to

$$\begin{cases} y \geq -3x \\ 4 \geq y \end{cases}$$



(B) Pick the correct answer. No justification is necessary.

(i) $x_1 - 2x_2 = 0$ has

a) one solution b) 2 solutions c) none d) infinitely many solutions

(ii) $x_1 - 2x_2 = 0$, $-3x_1 + 6x_2 = 0$ has

a) one solution b) 2 solutions c) none d) infinitely many solutions

(ii) $x_1 - 2x_2 = 0$, $x_1 + 2x_2 = 4$ has

a) one solution b) 2 solutions c) none d) infinitely many solutions

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III. (20 points.) Experience tells Mary if she works out one week there is 80% chance that she will work out again the following week. If she skips her work out one week there is 55% that she will skip it again the following week. Consider this problem a Markov Chain.

(A) If Mary works at the first week of December, what is the probability that she skips work out the third week of December?

(B) In the long run what is the probability that Mary works out each week?

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IV. (20 points.) John take out a mortgage of \$350,000 woth annual interest rate of 4% to be paid off in monthly payments.

(A) What will his monthly payments be?

(B) After 14 years how much of the loan has he paid off?

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V. (20 points.) Jane would like to make \$2,000 weekly withdrawals from her saving account for 6 years and be left with \$7,000 in the account at the end of the 6 years. Her account yields 3% annual interest compounded weekly. How much should she have in her account at the beginning of the 6 years to make this situation happen?