

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	

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

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

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).

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

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

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

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

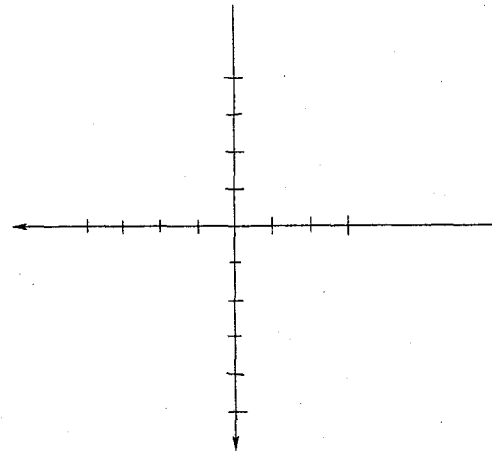
(B) Is $\begin{bmatrix} 0 & 1 \\ .5 & .5 \end{bmatrix}$ the transition matrix of a regular Markov chain? Justify your answer.

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

(i) $x_1 - 2x_2 = 0$ has
 a) one solution b) 2 solutions c) none d) infinitely many solutions

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



$$\begin{cases} 2y \leq x \\ 5 \geq y \end{cases}$$

(A) Graph the feasible set according to

II. (20 points.)

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

III. (20 points.) Experience tells Mary if she works out one week there is 85% chance that she will work out again the following week. If she skips her work out one week there is 65% 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?

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(B) After 12 years how much of the loan has he paid off?

(A) What will his monthly payments be?

IV. (20 points.) John take out a mortgage of \$300,000 with annual interest rate of 5% to be paid off in monthly payments.

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V. (20 points.) Jane would like to make \$1,000 weekly withdrawals from her saving account for 5 years and be left with \$5,000 in the account at the end of the 5 years. Her account yields 4% annual interest compounded weekly. How much should she have in her account at the beginning of the 5 years to make this situation happen?

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