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Answer each of the questions to the best of your ability. Please show all of your work for complete credit. Good luck!

1. Find the slope of the line between the points (4,1) and (0, 2). (2 points)

1. Solve the linear system for  $x$  and  $y$ . (4 points)

$$\begin{cases} x + y = 4 \\ 2x - y = 2 \end{cases}$$

1. Graph the line  $3x + 5y = 15$ . (4 points)

1. A company produces three combinations of mixed vegetables that sell in 1-kg packages. Italian style combines 0.3 kg of zucchini, 0.3 of broccoli and 0.4 of carrots. French style combines 0.6 kg of broccoli and 0.4 of carrots. Oriental style combines 0.2 kg of zucchini, 0.5 of broccoli, and 0.3 of carrots. The company has a stock of 16,200 kg of carrots, 41,400 kg of broccoli, and 29,400 kg of zucchini. How many packages of each style should it prepare in order to use up existing supplies? (6 points)

1. Suppose  $A = \begin{bmatrix} 2 & 2 \\ -3 & 0 \end{bmatrix}$  and  $B = \begin{bmatrix} 5 & 1 \\ 4 & -2 \end{bmatrix}$ . Calculate the following

(a)  $A - B$  (2 points)

(a)  $A + B$  (2 points)

(a)  $A \cdot B$  (4 points)

(a)  $B \cdot A$  (4 points)

(a)  $A^{-1}$ (by hand) (6 points)

2. Graph the feasible region for the following system of inequalities: (8 points)

$$x + 3y \leq 15$$

$$2x + y \leq 15$$

$$x \geq 0$$

$$y \geq 0$$

1. A bakery makes both cakes and cookies. Each cake requires 2 hours in the oven and 3 hours in the decorating room. Each batch of cookies needs 1.5 hours in the oven and  $\frac{2}{3}$  hours in the decorating room. The oven is available for no more than 15 hours per day, and the decorating room can be used no more than 13 hours per day. The baker charges \$10 per cake and \$7 per batch of cookies. How many cakes and batches of cookies should be made to maximize profit? Solve using the graphical method. (14 points)

1. A fashion store has \$8000 available each month for advertising. Newspaper ads cost \$400 each and no more than 20 can be run per month. Radio ads cost \$200 each and no more than 30 can be run per month. TV ads cost \$1200 each, with a maximum of 6 available each month. Approximately 2000 people will see each newspaper ad, 1200 will hear each radio commercial, and 10,000 will see each TV ad. How much of each type of advertising should be used if the store wants to maximize its ad exposure?

(a) Write a linear program representing this problem. (6 points)

(a) Convert your linear program into a simplex tableau. (2 points)

(a) Specify which element should be the pivot element. (2 points)

(a) Perform a pivot on your selected element. (6 points)

(a) Read the solution from your new simplex tableau. (2 points)

(a) Is this an optimal solution? How can you tell? (2 points)

2. Find the transpose of the following matrix. (2 points)

$$\begin{bmatrix} 1 & 3 & -1 \\ 9 & 0 & 2 \\ -3 & 7 & 5 \\ 4 & 6 & -4 \\ -2 & -5 & 8 \end{bmatrix}$$

1. Answer true or false: (2 points each)

(a) \_\_\_\_\_  $\{1, 3, 5, 7, 9\} \cup \{2, 4, 6, 8\} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

(b) \_\_\_\_\_  $\{3, 4, 5, 6\} \subset \{4, 5\}$

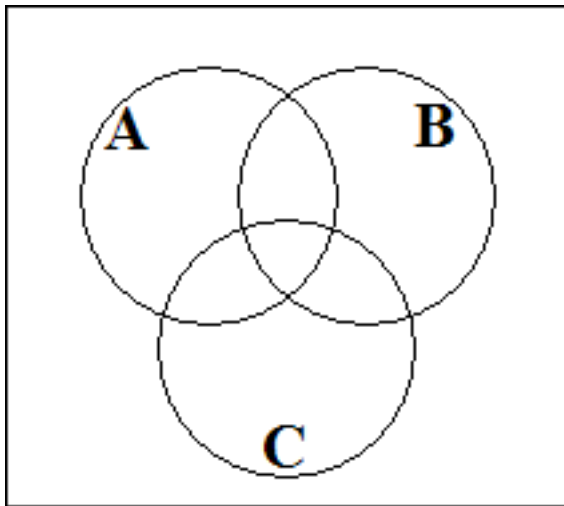
(c) \_\_\_\_\_  $48 \in \{x \mid x \text{ is an even integer divisible by } 4\}$

(d) \_\_\_\_\_  $0 \in \emptyset$

(e) \_\_\_\_\_  $\{1, 2, 3, 4, 5, 6, 7, 8, 9\} \cap \{1, 3, 5, 7, 9, 11\} = \{1, 3, 5, 7, 9\}$

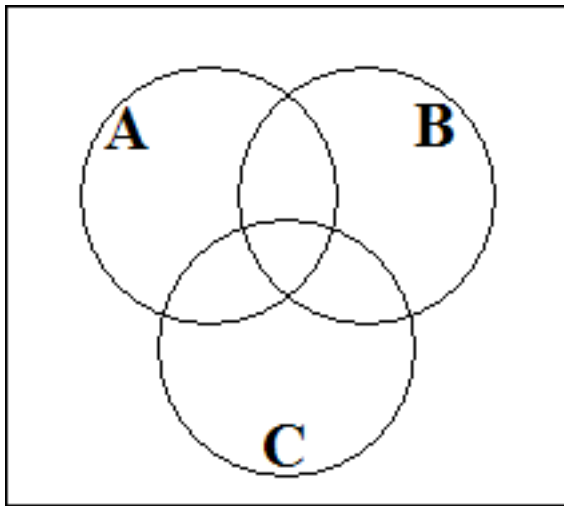
2. Shade in the specified region of the following Venn diagram: (6 points)

$$A' \cup (B \cap C')$$



3. Two fair dice are rolled. What is the probability that one of the dice is a 5 or the sum of the dice is 8? (4 points)

1. Toward the middle of the harvesting season, peaches for canning come in three types, early, late, and extra late, depending on the expected date of ripening. During a certain week, the following data were recorded at a fruit delivery station:
  - 34 trucks went out carrying early peaches;
  - 61 carried late peaches;
  - 50 carried extra late;
  - 25 carried early and late;
  - 30 carried late and extra late;
  - 8 carried early and extra late;
  - 6 carried all three;
  - 9 carried no peaches.



- (a) How many trucks carried only the late variety of peaches? (4 points)
  
- (a) How many trucks (in all) went out during the week? (6 points)
  
2. A fair die is rolled 6 times.
  - (a) Create a probability distribution for the number of “ones” observed. (10 points)
  
  - (a) What is the probability of getting less than 3 ones? (5 points)
  
  - (a) What is the probability of getting at least 4 ones? (5 points)

3. Calculate (by hand)  $\binom{9}{7}$  and  $P(9,7)$ . (4 points)
1. A committee of 6 people is chosen from a group of 15 people.
- (a) How many ways are there to choose the committee members? (6 points)
  
  - (a) How many ways are there to seat the committee members in the six chairs around their meeting table? (6 points)
  
  - (a) If a committee chairperson and vice-chairperson are to be chosen, how many ways are there to choose the committee? (6 points)
2. The probability that a soda vending machine downstairs takes my money without giving me a soda is 0.05. If I try to buy a soda before every class, what are the probabilities of each of the following events? (Assume there were 20 class periods)
- (a) I get exactly 19 sodas. (4 points)
  
  - (a) The machine steals my money more than once (i.e. I get at most 18 sodas). (6 points)
  
  - (a) I get no sodas. (4 points)
3. A local charity decides to raise money by raffling off prizes. They will give away one grand prize, worth \$1000, one first prize worth \$500, and four second prizes worth \$125 each. A total of 2000 tickets are sold at \$1 each. What is the expected value of winning for a person who buys only one ticket? Is this a fair game? (4 points)

Name \_\_\_\_\_  
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Finite Mathematics  
Final Exam

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(a) Find the probability that a sample lies above 19. (4 points)

2. In a normal distribution, what is the probability that a sample lies within two standard deviations of the mean? (2 points)