

Show work. Your work is part of your answer. You may use a calculator.

Name: _____

1. Write as an augmented matrix. Row reduce (to RREF). Interpret your result.

$$\begin{cases} x + 4y + z = 12 \\ 2y + 4z = 14 \\ -y + z = 1 \end{cases}$$

2. Compute the amount we will have in 3 years if we earn interest compounded monthly on \$300 at 5% APR.

3. If we invest \$100 at what percentage rate compounded continuously will result in \$700 after five years.

4. I invest \$10000 in an annuity that pays me monthly for twenty years. If the annuity company use 3.5%, what are my monthly payments?

5. Write the following system of linear equations as an augmented matrix.

$$\begin{cases} 3x & -y & = 2 \\ x & +3y & = 4 \end{cases}$$

6. Solve the previous system of linear equations by Gauss Jordan elimination. Reduce the augmented matrix to RREF and clearly state your answer.

7. This questions is about an economy based on corn and chickens. A farmer needs corn for his chickens to eat and she needs chickens in order to have future chickens. Additionally, the corn is used for future seed corn and chickens are used in making manure for the corn to grow.

Production of a dollar worth of corn requires an input of \$0.10 from the corn sector and \$0.05 from the chicken sector. Production of a dollar worth of chickens requires an input of \$0.50 from the corn sector and \$0.20 from the chickens sector. Find the output for each sector that is needed to satisfy a final demand of \$20 billion for corn and \$30 billion for chickens (we like a lot of chickens).

8. Graph the feasible region and find the corner points for the following. Is the region bounded or unbounded? Maximize and maximize the function $P = 4x + 3y$ subject to

$$\begin{cases} 3x + 4y \leq 60 \\ x + 6y \leq 60 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

9. Use the Simplex method to solve. Maximize $P = 4x_1 + 3x_2$ subject to

$$\begin{cases} 3x & +4y & \leq 60 \\ x & +6y & \leq 60 \\ x & & \geq 0 \\ & y & \geq 0 \end{cases}$$

10. Use the Simplex method to solve. Maximize $P = 10x_1 + 6x_2$ subject to

$$\begin{cases} 12x_1 & +x_2 & \leq 120 \\ 6x_1 & +6x_2 & \leq 120 \\ x_1 & +12x_2 & \leq 120 \\ \\ x_1 & & \geq 0 \\ & x_2 & \geq 0 \end{cases}$$

11. How many license plates can be made from a pattern with three letters and three digits?
12. How many possible ways can we order a meal deal where we get one drink, one potato or onion ring and one sandwich or one chicken nuggets from below menu items ?
- Drinks: Coke, Diet Coke, Sprite, or lemonade
 - Potatoes: fries, hashbrowns, or baked potato
 - Onion Rings: medium onion ring
 - Sandwiches: veggie burger, or cheese burger
 - Chicken nuggets: spicy or regular
13. The Math department DJ (Prof B) asks for suggestions of songs for the holiday party? Each of the twenty members of the department suggest one song. How many ways can the DJ select 10 songs for the party (where order does not matter)?
14. The Math department DJ (Prof B) asks for suggestions of songs for the holiday party? Each of the twenty members of the department suggest one song. How many playlists can the DJ make from 10 songs out of the 20 for the party (where order does matter)?

15. What is $n(A \cap B)$ out the 1000 total students we have $n(A) = 100$, $n(B) = 200$ and $n(A \cup B) = 250$?

16. We will assume you cannot be a fan of the Marvel movies and the DC movies. You are either Marvel or DC. And the other category is likes the Beatles, does not like the Beatles.

	Fan of Beatles (B)	Not a Fan of Beatles (B^c)
Fan of DC (DC)	35	55
Fan of Marvel (M)	65	38

What are the following?

- (a) $n(DC) =$
- (b) $n(M) =$
- (c) $n(B) =$
- (d) $n(B^c) =$
- (e) $n(M^c) =$
- (f) $n((M \cap B)) =$
- (g) $n((DC \cap B))/n(B) =$
- (h) $n((M \cap B))/n(B) =$

17. Roll a fair 4-sided die twice. Record the numbers on the rolls.
- (a) What is the Sample space?
 - (b) Let A be the event that we roll a 2 on the first roll. Write out A .
 - (c) Let B be the event that we roll a 1 on the second roll. Write out B .
 - (d) Let C be the event that we roll the sum of 5. Write out C .
 - (e) Let D be the event that we roll the sum of 6. Write out D .
18. Continue with the experiment of rolling a fair 4-sided die twice. Record the numbers on the rolls.
- (a) What are the probabilities of A , B , C and D ?
 - (b) What are the probabilities of $A \cap C$, $A \cap B$, and $A \cap D$?
 - (c) Compute $P(A|B)$, $P(B|A)$, $P(A|C)$, $P(A|D)$.
 - (d) Are A and B independent? Are A and C independent? Are A and D independent?
 - (e) Are B and D independent?

- Simple Interest

$$A = P(1 + rt)$$

- Compound interest

$$A = P\left(1 + \frac{r}{m}\right)^{mt}, \text{ and } A = P(1 + i)^n$$

- Continuously compounded

$$A = Pe^{rt}$$

- Future Value

$$FV = PMT \frac{(1 + i)^n - 1}{i}$$

- Present Value

$$PV = PMT \frac{1 - (1 + i)^{-n}}{i}$$

- Leontief Input output matrices

$$X = (I - M)^{-1}D$$