

Math 210 Sample Final Exam

1. You wish to purchase a house. You have a down-payment of \$12,000 and can afford a mortgage of \$900 per month. You find a 30 year loan that charges 7.2% compounded monthly. What price can you afford for your house?
 - (a) \$228,431
 - (b) \$359,328
 - (c) \$126,307
 - (d) \$144,589
 - (e) \$324,000

2. Mom and Dad and their 4 children line up for a picture. How many different pictures can be taken if Mom and Dad do not have the four children between them?
 - (a) 964
 - (b) 480
 - (c) 240
 - (d) 672
 - (e) 124

3. Maximize $P = 2x + 10y + 6z$ subject to the constraints:

$$\begin{aligned}x + 2y &\leq 10 \\y + 3z &\leq 24 \\x, y, z &\geq 0\end{aligned}$$

The optimal solution is:

- (a) $x = 44, y = 0, z = 0$.
- (b) $x = 0, y = 5, z = 19/3$.
- (c) $x = 19/3, y = 0, z = 5$.
- (d) $x = 5, y = 19/3, z = 0$.
- (e) $x = 0, y = 19/3, z = 5$.

4. Which entry is a possible pivot in the following simplex tableau?

$$\left[\begin{array}{cccccc|c} 15 & 1 & -3 & 1 & 0 & 0 & 6 \\ -2 & -3 & 4 & 0 & 1 & 0 & -50 \\ -2 & 3 & 4 & 0 & 0 & 1 & 0 \end{array} \right]$$

- (a) 15.
- (b) -2.
- (c) 1.
- (d) -3.
- (e) None of the above.

5. In solving a system of linear equations using Gauss-Jordan elimination, the following augmented matrix is obtained:

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & 6 \\ 0 & 1 & 2 & 7 \\ 0 & 0 & 0 & 0 \end{array} \right]$$

Which is true?

- (a) There are no solutions for this problem.
- (b) There are infinitely many solutions, one of which is $x = 9, y = 5, z = 1$.
- (c) There is exactly one solution and $x = 6, y = 7, z = 0$.
- (d) There are infinitely many solutions, one of which is $x = 0, y = 11, z = 2$.
- (e) There are exactly two solutions for this problem.

6. In a shipment of 100 cars from Japan:

33 have a four-cylinder engine,

45 have tilt steering wheels,

27 have air conditioning,

30 have both four-cylinder engines and tilt steering wheels,

25 have tilt steering wheels and air conditioning,

18 have four-cylinder engines, tilt steering wheels and air conditioning,

20 have air conditioning and a four-cylinder engine. How many cars have

air conditioning and neither tilt steering wheels nor four-cylinder engines?

- (a) 4
- (b) 0
- (c) 3
- (d) 5
- (e) None of the above.

7. Jack and Sally want to buy a house that costs \$210,000. They put \$20,000 down and get a 20 year loan at 7.8%. What will their monthly mortgage payment be?

- (a) \$3748
- (b) \$1349
- (c) \$1730
- (d) \$1566
- (e) \$792

8. Solve the system :

$$\begin{aligned}x - y + 5z &= 13 \\y - 2z &= -7 \\y + 8z &= 33\end{aligned}$$

- (a) In the solution: $x = -6$.
- (b) In the solution: $x = 1$.
- (c) There are infinitely many solutions.
- (d) No solution; the equations are inconsistent.
- (e) In the solution: $x = -3$.

9. 1000 tickets are sold earning \$5100. Adult tickets cost \$6 and childrens cost \$4. How many adult tickets were sold?

- (a) 550
- (b) 450
- (c) 620
- (d) 470
- (e) 320

10. A box contains 12 eggs of which 4 are rotten. If six are selected at random, what is the probability that at least one is rotten?

- (a) $32/33$.
- (b) $1/3$.
- (c) $14/33$.
- (d) $1/33$.
- (e) None of the above.

11. Minimize $C = 5x + 7y - z$ subject to the constraints:

$$\begin{aligned} 2x + y + z &\leq 12 \\ x, y, z &\geq 0 \end{aligned}$$

The optimal solution is:

- (a) $x = 7, y = 8, z = 0.$
 - (b) $x = 0, y = 0, z = 24.$
 - (c) $x = 5, y = 7, z = 0.$
 - (d) $x = 0, y = 0, z = 12.$
 - (e) None of the above.
12. The line $3x + 4y = 24$ has x-intercept:
- (a) 3
 - (b) 4
 - (c) 8
 - (d) 24
 - (e) None of the above.
13. Amongst families with four children; are the events "At least one boy" and "At least one boy and at least one girl" independent?
- (a) No
 - (b) Yes
 - (c) Neither of the above is true
 - (d) All of the above are true
 - (e) None of the above.
14. If I put \$5000 into an account earning 6% interest compounded monthly, how much will I have after 7 years?
- (a) \$7602
 - (b) \$7100
 - (c) \$3288
 - (d) \$8493
 - (e) \$6431

15. Fred puts \$75 each month into an account earning 6% interest. How much will he have after 15 years?
- (a) \$21,811
 - (b) \$25,650
 - (c) \$13,500
 - (d) \$17,962
 - (e) \$33,130

16. If $\Pr(E)=1/12$, $\Pr(E \cup F)=1/6$, and E and F are mutually exclusive events then $\Pr(F)=$
- (a) $1/11$.
 - (b) $1/72$.
 - (c) $1/24$.
 - (d) $1/6$.
 - (e) None of the above.

17. Find the inverse of

$$\begin{pmatrix} 1 & 0 & 5 \\ 0 & 5 & 6 \\ 0 & 5 & 7 \end{pmatrix}$$

The entry in the third row and third column is:

- (a) 0.
 - (b) $1/7$.
 - (c) -1.
 - (d) 1.
 - (e) None of the above.
18. What is the effective interest rate for an account making 7.5% compounded weekly? (i.e. 52 times a year)
- (a) 7.78%
 - (b) 3.9%
 - (c) 7.63%
 - (d) 43.0%
 - (e) 8.23%

19. Which of the following is *not* a corner point of the region:

$$\begin{cases} 2x + y \leq 25 \\ x + y \leq 20 \\ x \leq 12 \\ x, y \geq 0 \end{cases}$$

- (a) (5,15)
- (b) (12,1)
- (c) (12,0)
- (d) (0,25)
- (e) (0,0)

20. A company produces two models of fax machines: a Value and a Deluxe. Each Value model costs \$200 to make while each Deluxe costs \$300 to make. The profits are \$25 for each Value model and \$40 for each Deluxe. The total number of fax machines demanded per month does not exceed 2500 and the company has a budget of \$600,000 for manufacturing costs. How many units of each model should the company produce in order to maximize its profits? Suppose that x Value models and y Deluxe models are produced per month.

The maximum profit is :

- (a) \$75,000
- (b) \$77,500
- (c) \$17,000
- (d) \$80,000
- (e) None of the above.

21. In how many ways can the positions of President, Vice-President and Secretary of a club be filled if they are to be chosen from the 15 members and no member can hold more than one position?

- (a) 42.
- (b) 3.
- (c) 2730.
- (d) 15.
- (e) 3375.

22. If $\Pr(E)=1/12$, $\Pr(E \cup F)=1/6$, and E and F are independent events then $\Pr(F)=$
- (a) $1/11$.
 - (b) $1/6$.
 - (c) $1/72$.
 - (d) $1/24$.
 - (e) None of the above.

23. Solve the system:

$$\begin{aligned}x + y - 2z &= 3 \\2x - 3y + 3z &= 2 \\5x - 5y + 4z &= 6\end{aligned}$$

- (a) In the solution $x = 1$.
 - (b) The system is inconsistent.
 - (c) In the solution $x = 2$.
 - (d) In the solution $x = 3$.
 - (e) In the solution $x = 4$.
24. Which of the following is true if $A = \{1, 3, 5, 8, 9, 10\}$ and $B = \{2, 4, 6, 8, 10\}$?
- (a) A and B are disjoint.
 - (b) $A \cap B = \{1, 2, 3, 4, 5, 6, 8, 9, 10\}$
 - (c) $A^c \cap B = \{1, 3, 5, 9\}$
 - (d) $A \cup B = \{8, 10\}$
 - (e) $3 \in A \cap B^c$
25. Urn I contains three balls, one red and two blue. Urn II contains five balls, two red and three green. An urn is chosen at random and a ball is selected from it. What is the probability that the ball is red?
- (a) $1/2$.
 - (b) $11/15$.
 - (c) $11/30$.
 - (d) $1/3$.
 - (e) $2/5$.