

FALL 2014 MATH 1324 REVIEW EXAM 3

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find the pivot in the tableau.

1)

$$\begin{array}{cccccc|c} x_1 & x_2 & x_3 & x_4 & x_5 & z & \\ \hline 2 & 1 & 4 & 1 & 0 & 0 & 48 \\ 2 & 4 & 1 & 0 & 1 & 0 & 32 \\ \hline -1 & -3 & -2 & 0 & 0 & 1 & 0 \end{array}$$

1) _____

2)

$$\begin{array}{cccccc|c} x_1 & x_2 & x_3 & x_4 & x_5 & x_6 & z & \\ \hline 1 & 2 & 1 & 1 & 0 & 0 & 0 & 14 \\ 2 & 2 & 3 & 0 & 1 & 0 & 0 & 36 \\ 4 & 1 & 1 & 0 & 0 & 1 & 0 & 18 \\ \hline -2 & -1 & -3 & 0 & 0 & 0 & 1 & 0 \end{array}$$

2) _____

Use the indicated entry as the pivot and perform the pivoting once.

3)

$$\begin{array}{cccccc|c} x_1 & x_2 & x_3 & x_4 & x_5 & z & \\ \hline \textcircled{2} & 1 & 4 & 1 & 0 & 0 & 32 \\ 2 & 4 & 1 & 0 & 1 & 0 & 48 \\ \hline -4 & -3 & -2 & 0 & 0 & 1 & 0 \end{array}$$

3) _____

4)

$$\begin{array}{cccccc|c} x_1 & x_2 & x_3 & x_4 & x_5 & x_6 & z & \\ \hline 1 & 2 & \textcircled{1} & 1 & 0 & 0 & 0 & 10 \\ 2 & 2 & 3 & 0 & 1 & 0 & 0 & 36 \\ 4 & 1 & 1 & 0 & 0 & 1 & 0 & 18 \\ \hline -2 & -1 & -3 & 0 & 0 & 0 & 1 & 0 \end{array}$$

4) _____

Write the basic solution for the simplex tableau determined by setting the nonbasic variables equal to 0.

5)

$$\begin{array}{cccccc|c} x_1 & x_2 & x_3 & x_4 & x_5 & z & \\ \hline 1 & 0 & 1 & 3 & 0 & 0 & 3 \\ 3 & 0 & 0 & 1 & 1 & 0 & 12 \\ 3 & 1 & 0 & 2 & 0 & 0 & 27 \\ \hline 2 & 0 & 0 & 3 & 0 & 1 & 17 \end{array}$$

5) _____

6)

$$\begin{array}{cccccc|c} x_1 & x_2 & x_3 & x_4 & x_5 & z & \\ \hline 0 & 3 & 0 & 1 & 1 & 0 & 3 \\ 0 & 4 & 1 & 0 & 1 & 0 & 3 \\ 1 & 5 & 0 & 0 & 1 & 0 & 15 \\ \hline 0 & -3 & 0 & 0 & 1 & 1 & 9 \end{array}$$

6) _____

Use the simplex method to solve the linear programming problem.

7) Maximize $z = 5x_1 + 3x_2$
 subject to: $2x_1 + 4x_2 \leq 13$
 $x_1 + 2x_2 \leq 6$
 with $x_1 \geq 0, x_2 \geq 0$

7) _____

A bakery makes sweet rolls and donuts. A batch of sweet rolls requires 3 lb of flour, 1 dozen eggs, and 2 lb of sugar. A batch of donuts requires 5 lb of flour, 3 dozen eggs, and 2 lb of sugar. Set up an initial simplex tableau to maximize profit.

8) The bakery has 480 lb of flour, 640 dozen eggs, 640 lb of sugar. The profit on a batch of sweet rolls is \$72.00 and on a batch of donuts is \$123.00.

8) _____

A manufacturing company wants to maximize profits on products A, B, and C. The profit margin is \$3 for A, \$6 for B, and \$15 for C. The production requirements and departmental capacities are as follows:

Department	Production requirement by product (hours)			Departmental capacity (Total hours)
	A	B	C	
Assembling	2	3	2	30,000
Painting	1	2	2	38,000
Finishing	2	3	1	28,000

9) What are the coefficients of the objective function?

9) _____

10) What is the constraint for the painting department?

10) _____

11) What is the maximum profit in this model?

11) _____

Find the transpose of the matrix.

12)
$$\begin{bmatrix} 6 & 0 & 3 \\ 1 & 3 & 5 \\ 9 & 8 & 7 \\ 3 & 6 & 9 \end{bmatrix}$$

12) _____

State the dual problem. Use y_1 , y_2 , and y_3 as the variables. Given: $y_1 \geq 0$, $y_2 \geq 0$, and $y_3 \geq 0$.

13) Minimize $w = 6x_1 + 3x_2$
 subject to: $3x_1 + 2x_2 \geq 25$
 $2x_1 + 5x_2 \geq 36$
 $x_1 \geq 0, x_2 \geq 0$

13) _____

Use duality to solve the problem.

$$\begin{aligned} 14) \text{ Minimize } & w = 5y_1 + 2y_2 \\ \text{subject to: } & y_1 + y_2 \geq 19.5 \\ & 2y_1 + y_2 \geq 24 \\ & y_1 \geq 0, y_2 \geq 0 \end{aligned}$$

14) _____

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

Tell whether the statement is true or false.

$$15) \{5, 8, 13\} = \{0, 5, 8, 13\}$$

15) _____

$$16) \{3, 17, 26, 10, 35\} = \{35, 17, 10, 62, 3\}$$

16) _____

$$17) \{x \mid x \text{ is a counting number greater than } 36\} = \{36, 37, 38, \dots\}$$

17) _____

$$18) \{3, 9, 14\} = \{0, 3, 9, 14\}$$

18) _____

$$19) \{59, 60, 59, 60\} = \{59, 60\}$$

19) _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Insert " $\subseteq$ " or " $\not\subseteq$ " in the blank to make the statement true.

$$20) \{2, 4, 6\} \underline{\hspace{1cm}} \{1, 2, 3, 4, 6\}$$

20) _____

Find the number of subsets of the set.

$$21) \{13, 14, 15\}$$

21) _____

$$22) \{x \mid x \text{ is a day of the week}\}$$

22) _____

Let $U = \{q, r, s, t, u, v, w, x, y, z\}$; $A = \{q, s, u, w, y\}$; $B = \{q, s, y, z\}$; and $C = \{v, w, x, y, z\}$. List the members of the indicated set, using set braces.

$$23) A \cap B'$$

23) _____

$$24) B \cap (A \cup C)$$

24) _____

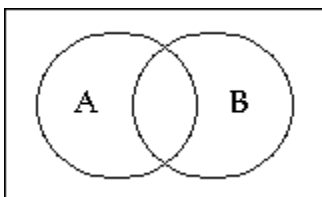
$$25) C' \cap A'$$

25) _____

Shade the Venn diagram to represent the set.

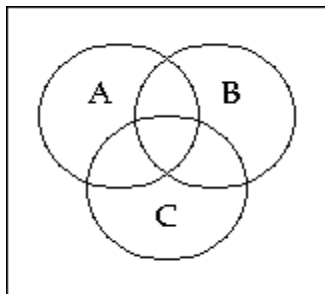
$$26) A' \cap B'$$

26) _____



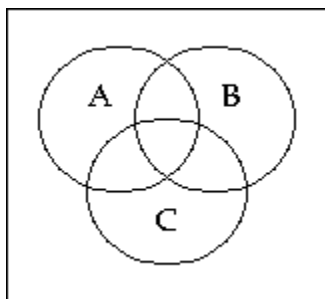
27) $C' \cap (A \cup B)$

27) _____



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

28) _____



Use the union rule to answer the question.

29) If $n(A) = 5$, $n(B) = 11$, and $n(A \cap B) = 3$; what is $n(A \cup B)$?

29) _____

30) If $n(A) = 40$, $n(B) = 117$, and $n(A \cup B) = 137$; what is $n(A \cap B)$?

30) _____

Answer Key

Testname: FALL 2014 MATH 1324 REV EX 3

1) 4 in row 2, column 2

2) 3 in row 2, column 3

3)

$$\begin{array}{cccccc|c} x_1 & x_2 & x_3 & x_4 & x_5 & z & \\ \hline 1 & \frac{1}{2} & 2 & \frac{1}{2} & 0 & 0 & 16 \\ 0 & 3 & -3 & -1 & 1 & 0 & 16 \\ \hline 0 & -1 & 6 & 2 & 0 & 1 & 64 \end{array}$$

4)

$$\begin{array}{cccccc|c} x_1 & x_2 & x_3 & x_4 & x_5 & x_6 & z & \\ \hline 1 & 2 & 1 & 1 & 0 & 0 & 0 & 10 \\ -1 & -4 & 0 & -3 & 1 & 0 & 0 & 6 \\ 3 & -1 & 0 & -1 & 0 & 1 & 0 & 8 \\ \hline 1 & 5 & 0 & 3 & 0 & 0 & 1 & 30 \end{array}$$

5) $x_1 = 0, x_2 = 27, x_3 = 3, x_4 = 0, x_5 = 12, z = 17$

6) $x_1 = 15, x_2 = 0, x_3 = 3, x_4 = 3, x_5 = 0, z = 9$

7) Maximum is 30 when $x_1 = 6, x_2 = 0$

8)

$$\begin{array}{cccccc|c} x_1 & x_2 & x_3 & x_4 & x_5 & x_6 & \\ \hline 3 & 5 & 1 & 0 & 0 & 0 & 480 \\ 1 & 3 & 0 & 1 & 0 & 0 & 640 \\ 2 & 2 & 0 & 0 & 1 & 0 & 640 \\ \hline -72 & -123 & 0 & 0 & 0 & 1 & 0 \end{array}$$

9) 3, 6, 15

10) $1A + 2B + 2C \leq 38,000$

11) \$225,000

12)

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

13) Maximize $z = 25y_1 + 36y_2$

subject to: $3y_1 + 2y_2 \leq 6$

$2y_1 + 5y_2 \leq 3$

14) 48

15) FALSE

16) FALSE

17) FALSE

18) FALSE

19) TRUE

20) $\subseteq$

21) 8

22) 128

23) $\{u, w\}$

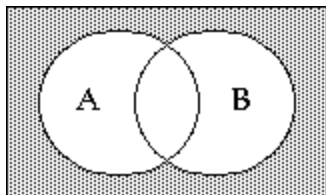
24) $\{q, s, y, z\}$

25) $\{r, t\}$

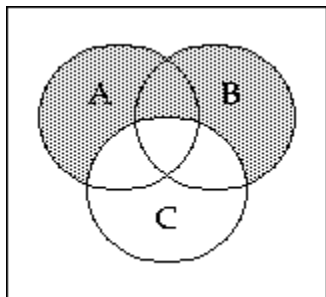
Answer Key

Testname: FALL 2014 MATH 1324 REV EX 3

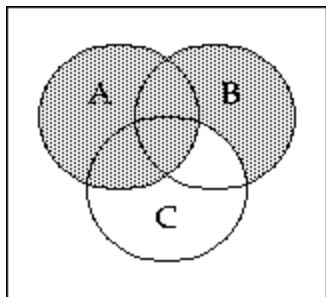
26)



27)



28)



29) 13

30) 20