Math 1324: Test 2 Review
Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question

Find the inverse, if it exists, for the matrix.

1) $\begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ 1) _____

A) $\begin{bmatrix} -1 & 0 & 0 \\ -1 & -1 & 0 \\ -1 & -1 & -1 \end{bmatrix}$

B) $\begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$

C) $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

D) $\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ -2 & -1 & 1 \end{bmatrix}$

2) $\begin{bmatrix} 2 & 1 \\ 0 & -6 \end{bmatrix}$ 2) _____

A) $\begin{bmatrix} \frac{1}{2} & -\frac{1}{12} \\ 0 & -\frac{1}{6} \end{bmatrix}$

B) $\begin{bmatrix} -\frac{1}{6} & \frac{1}{12} \\ 0 & \frac{1}{2} \end{bmatrix}$

C) $\begin{bmatrix} \frac{1}{2} & \frac{1}{12} \\ 0 & -\frac{1}{6} \end{bmatrix}$

D) $\begin{bmatrix} 0 & -\frac{1}{6} \\ \frac{1}{2} & \frac{1}{12} \end{bmatrix}$

Solve the system of equations by using the inverse of the coefficient matrix.

3) $-2x + 6y = 6$ 3) _____
$3x + 2y = 13$

A) (3, 2) B) (–3, –2) C) (2, 3) D) (–2, –3)

4) $5x + y = 27$ 4) _____
$-2x + 4y = -24$

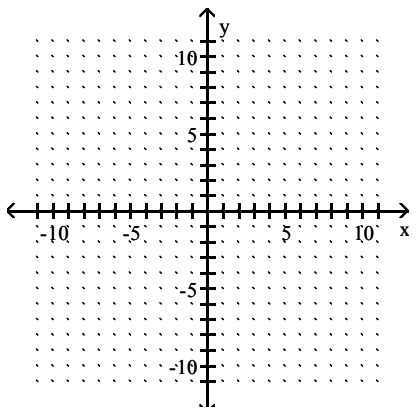
A) (–3, 6) B) (–3, –6)
C) (6, –3) D) No inverse, no solution for system

5) $x + y + z = 2$ 5) _____
$x - y + 2z = -9$
$4x + y + z = 14$

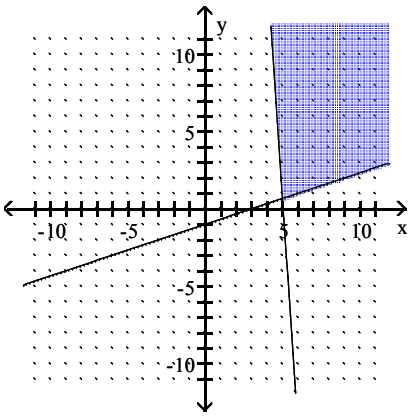
A) (–5, 4, 3) B) (–5, 3, 4)
C) (4, 3, –5) D) No inverse, no solution for system

Graph the feasible region for the system of inequalities.

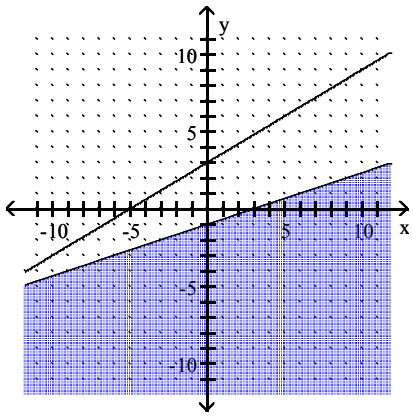
6) $3x + 5y \leq 15$ 6) _____
$x - 3y \leq 3$



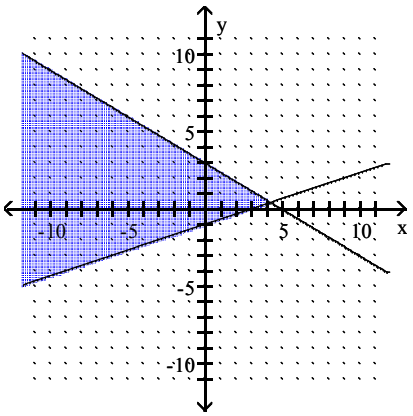
A)


y
x
10
5
-5
-10
-10
-5
5
10

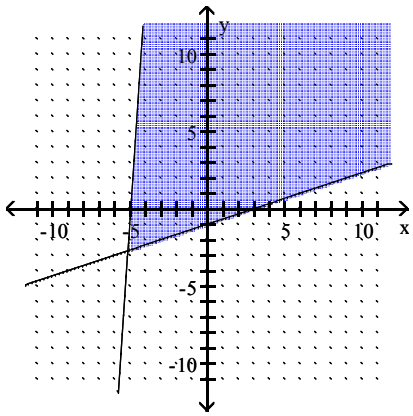
B)


y
x
10
5
-5
-10
-10
-5
5
10

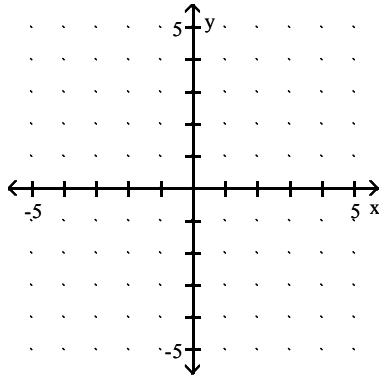
C)


y
x
10
5
-5
-10
-10
-5
5
10

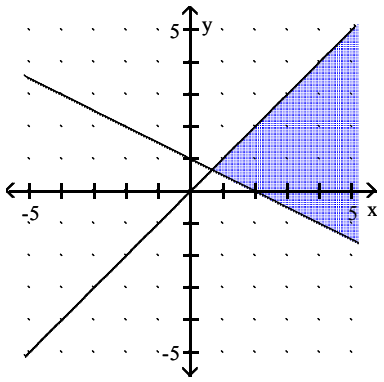
D)


y
x
10
5
-5
-10
-10
-5
5
10

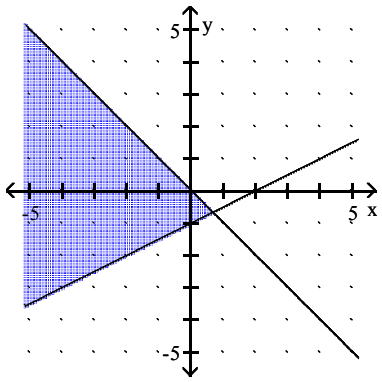
7) $x + 2y \le 2$
$x + y \ge 0$ 7) _____



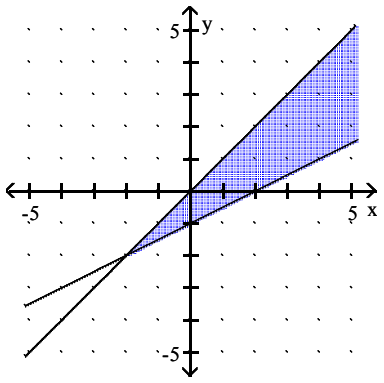
A)



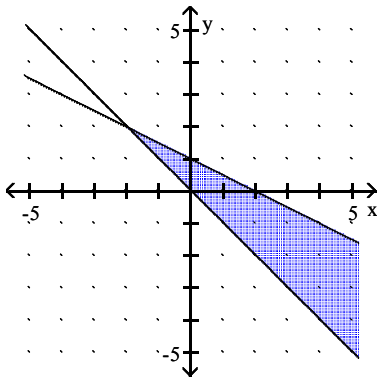
B)



C)



D)

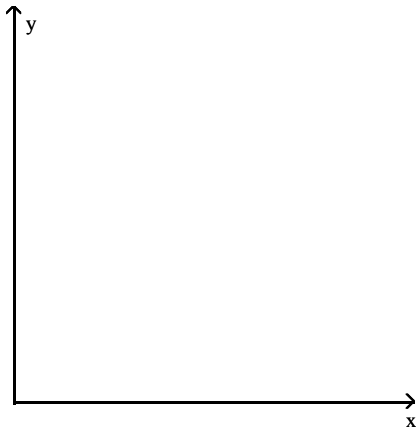


Graph the feasible region of the system.

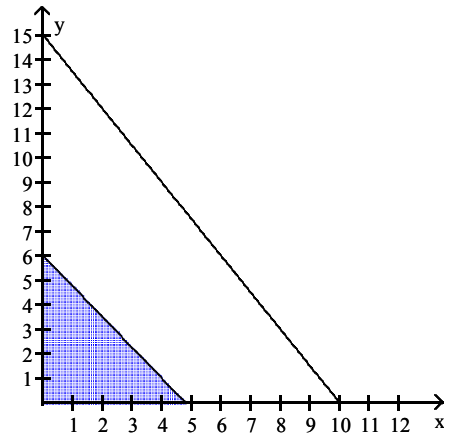
8) A manufacturer of wooden chairs and tables must decide in advance how many of each item will be made in a given week. Use the table to find the system of inequalities that describes the manufacturer's weekly production. 8) _____

Use x for the number of chairs and y for the number of tables made per week. The number of work–hours available for construction and finishing is fixed.

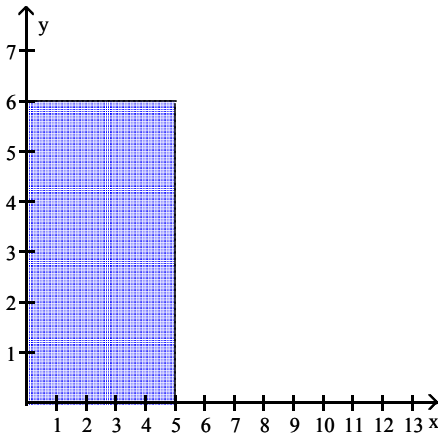
	Hours per chair	Hours per table	Total hours available
Construction	3	5	30
Finishing	2	4	24


y
x

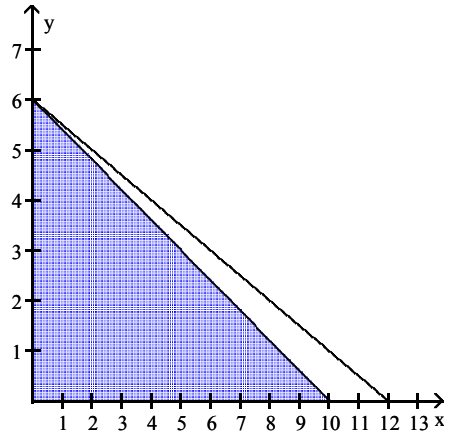
A)


y
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1 2 3 4 5 6 7 8 9 10 11 12 x

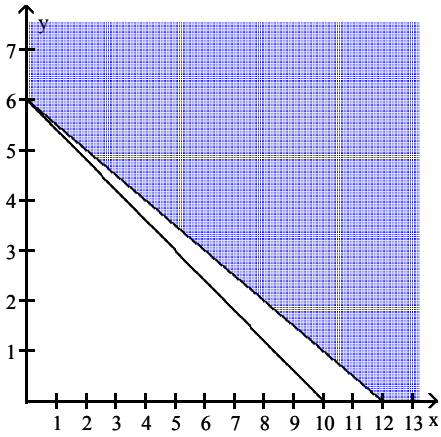
B)


y
7
6
5
4
3
2
1
1 2 3 4 5 6 7 8 9 10 11 12 13 x

C)


y
7
6
5
4
3
2
1
1 2 3 4 5 6 7 8 9 10 11 12 13 x

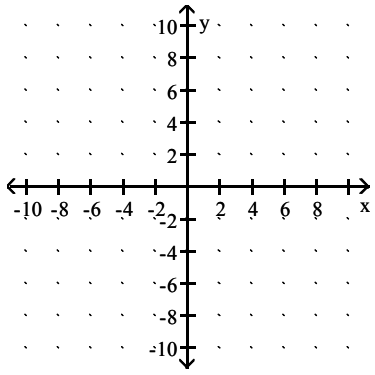
D)


y
7
6
5
4
3
2
1
1 2 3 4 5 6 7 8 9 10 11 12 13 x

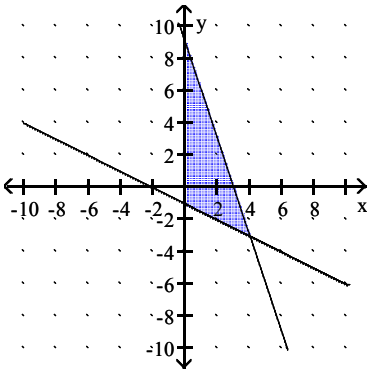
Graph the feasible region for the system of inequalities.

9) $2y + x \geq -2$
$y + 3x \leq 9$
$y \leq 0$
$x \geq 0$

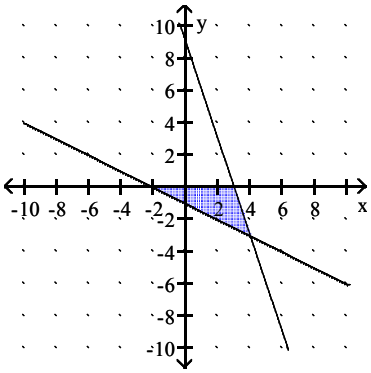
9) _____



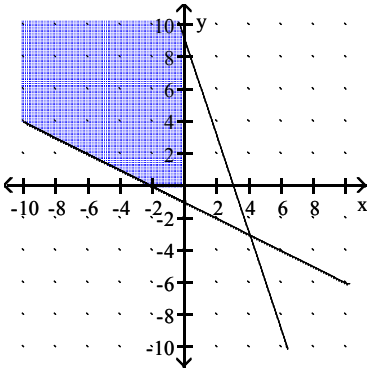
A)



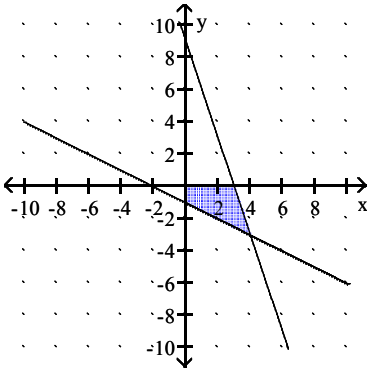
B)



C)

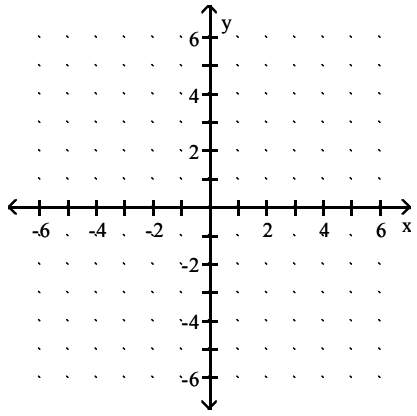


D)

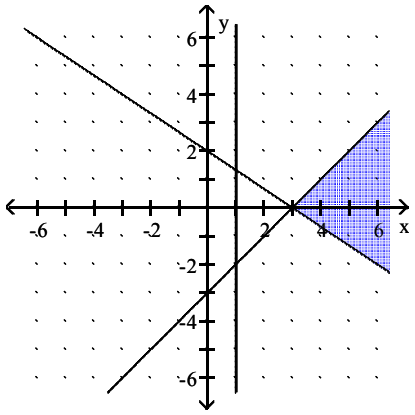


10) $2x + 3y \geq 6$
$x - y \leq 3$
$x \geq 1$

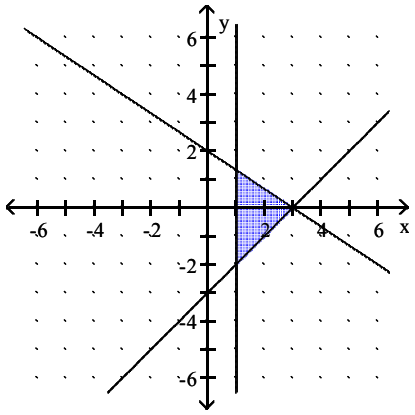
10) _____



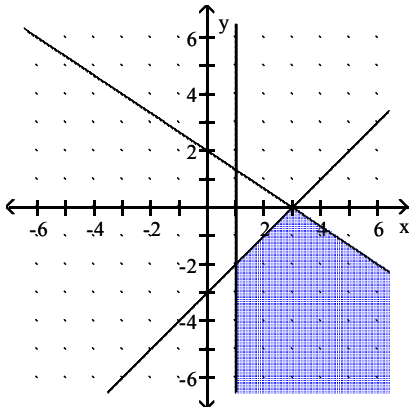
A)



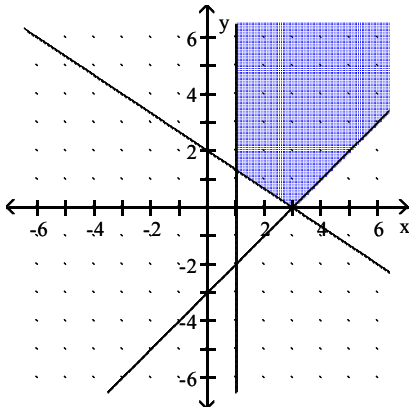
B)



C)

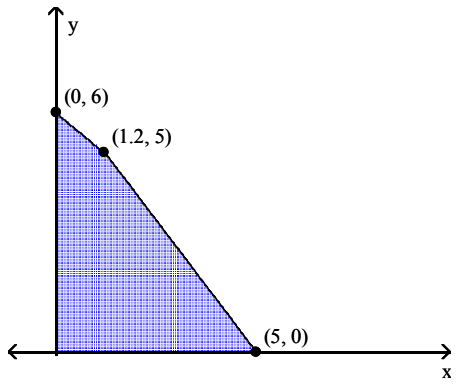


D)



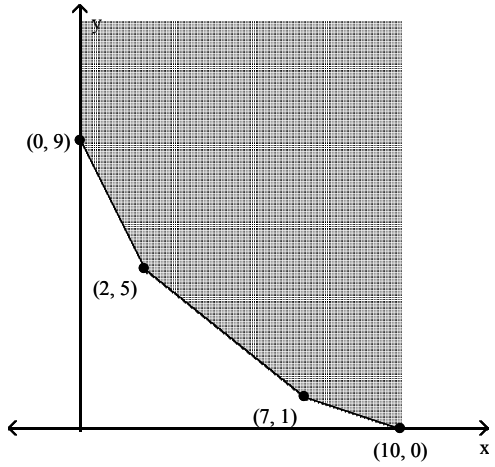
Use the indicated region of feasible solutions to find the maximum and minimum values of the given objective function.

11) $z = 8x - 14y$ 11) _____



A) Maximum of 40; minimum of –84
B) Maximum of –84; minimum of 0
C) Maximum of –60; minimum of –84
D) Maximum of 40; minimum of 0

12) $z = x + 7y$ 12) _____



A) No maximum; minimum of 14
B) Maximum of 63; no minimum
C) Maximum of 63; minimum of 10
D) No maximum; minimum of 10

Use graphical methods to solve the linear programming problem.

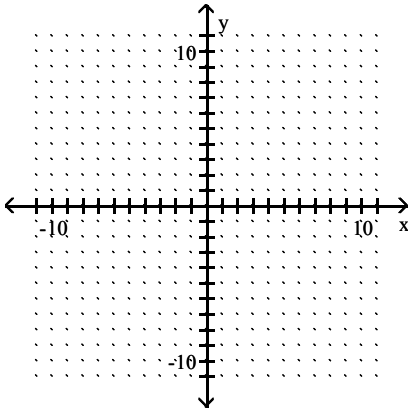
13) Maximize $z = 8x + 12y$ 13) _____

subject to: $40x + 80y \leq 560$

$6x + 8y \leq 72$

$x \geq 0$

$y \geq 0$



A) Maximum of 96 when $x = 9$ and $y = 2$

B) Maximum of 100 when $x = 8$ and $y = 3$

C) Maximum of 92 when $x = 4$ and $y = 5$

D) Maximum of 120 when $x = 3$ and $y = 8$

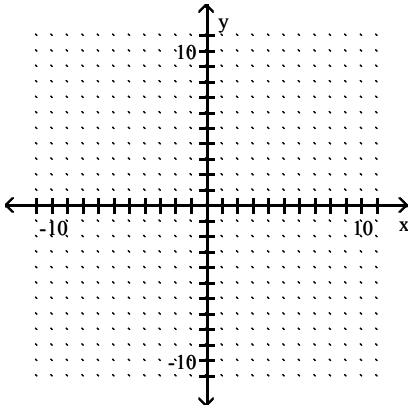
14) Maximize $z = 2x + 5y$ 14) _____

subject to: $3x + 2y \leq 6$

$-2x + 4y \leq 8$

$x \geq 0$

$y \geq 0$



A) Maximum of 19 when $x = 2$ and $y = 3$

B) Maximum of $\frac{49}{4}$ when $x = \frac{1}{2}$ and $y = \frac{9}{4}$

C) Maximum of 10 when $x = 0$ and $y = 2$

D) Maximum of $\frac{34}{3}$ when $x = \frac{2}{3}$ and $y = 2$

Solve the problem.

15) The Acme Class Ring Company designs and sells two types of rings: the VIP and the SST. They can produce up to 24 rings each day using up to 60 total man–hours of labor. It takes 3 man–hours to make one VIP ring and 2 man–hours to make one SST ring. How many of each type of ring should be made daily to maximize the company's profit, if the profit on a VIP ring is $30 and on an SST ring is $40? 15) _____

A) 8 VIP and 16 SST
B) 12 VIP and 12 SST
C) 0 VIP and 24 SST
D) 16 VIP and 8 SST

16) A company manufactures two ballpoint pens, silver and gold. The silver requires 2 min in a grinder and 3 min in a bonder. The gold requires 7 min in a grinder and 8 min in a bonder. The grinder can be run no more than 64 hours per week and the bonder no more than 80 hours per week. The company makes a $3 profit on each silver pen sold and $8 on each gold. How many of each type should be made each week to maximize profits? 16) _____

A) Silver pens: 2
Gold pens: 548
B) Silver pens: 0
Gold pens: 547
C) Silver pens: 548
Gold pens: 3
D) Silver pens: 3
Gold pens: 547

Introduce slack variables as necessary and write the initial simplex tableau for the problem.

17) Maximize $z = 4x + y$ 17) _____
subject to: $2x + 5y \le 10$
$3x + 3y \le 14$
$x \ge 0,\ y \ge 0$

$$\left[\begin{array}{c|c} & \\ \hline & \end{array}\right]$$

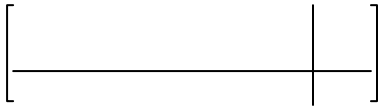
A)
$$\left[\begin{array}{ccccc|c} x & y & s_1 & s_2 & z & \\ \hline 2 & 5 & 1 & 0 & 0 & 14 \\ 3 & 3 & 0 & 1 & 0 & 10 \\ \hline 4 & 1 & 0 & 0 & 1 & 0 \end{array}\right]$$

B)
$$\left[\begin{array}{ccccc|c} x & y & s_1 & s_2 & z & \\ \hline 2 & 5 & 1 & 0 & 0 & 10 \\ 3 & 3 & 0 & 1 & 0 & 14 \\ \hline 4 & 1 & 0 & 0 & 1 & 0 \end{array}\right]$$

C)
$$\left[\begin{array}{ccccc|c} x & y & s_1 & s_2 & z & \\ \hline 2 & 5 & 1 & 0 & 0 & 10 \\ 3 & 3 & 0 & 1 & 0 & 14 \\ \hline -4 & -1 & 0 & 0 & 1 & 0 \end{array}\right]$$

D)
$$\left[\begin{array}{ccccc|c} x & y & s_1 & s_2 & z & \\ \hline 2 & 5 & 1 & 0 & 0 & 14 \\ 3 & 3 & 0 & 1 & 0 & 10 \\ \hline -4 & -1 & 0 & 0 & 1 & 0 \end{array}\right]$$

18) Maximize $z = 4x + 2y$ 18) _____
subject to: $2x + y \le 16$
$3x + 5y \le 65$
$x \ge 0,\ y \ge 0$



A)
x	y	s_1	s_2	z	
2	1	1	1	0	16
3	5	0	0	0	65
−4	−2	0	0	1	0

B)
x	y	s_1	s_2	z	
2	1	1	0	0	16
3	5	0	1	0	65
−4	−2	0	0	1	0

C)
x	y	s_1	s_2	z	
2	1	1	0	0	16
3	5	0	1	0	65
4	2	0	0	1	0

D)
x	y	s_1	s_2	z	
2	1	1	0	0	65
3	5	0	1	0	16
−4	−2	0	0	1	0

The matrix shown represents a simplex tableau after a sequence of pivot operations has been performed on an initial tableau. Answer the question about the simplex tableau.

19)
x	y	s_1	s_2	f	
1	0	46	61	0	139
0	1	8	85	0	152
0	0	12	167	1	260

19) _____

Does this table indicate that a maximum has been reached? If so, what is the maximum and where is it reached?

A) No, maximum has not been reached
B) Yes; maximum value of f is 139 when x = 12 and y = 167
C) Yes; maximum value of f is 1 when x = 139 and y = 152
D) Yes; maximum value of f is 260 when x = 139 and y = 152

20)
x	y	z	s_1	s_2	f	
1	19	0	19	40	0	57
0	22	1	22	1	0	103
0	0	0	−1	165	1	163

20) _____

Does this tableau indicate that a maximum has been reached? If so, what is the maximum value and where is it reached?

A) No, maximum has not been reached
B) Yes; maximum value of f is 1 when x = 57 and y = 103
C) Yes; maximum value of f is 163 when x = 0 and y = 0
D) Yes; maximum value of f is 163 when x = 57 and y = 103

Use the simplex algorithm to solve the linear programming problem.

21) Maximize $5x + 3y = f$ 21) _____
Subject to $2x + 4y \le 13$
$x + 2y \le 6$
$x \ge 0, y \ge 0$

A) maximum: $f = 32.5$ when $x = 6.5$ and $y = 0$
B) maximum: $f = 9$ when $x = 0$ and $y = 3$
C) maximum: $f = 30$ when $x = 6$ and $y = 0$
D) maximum: $f = 30.75$ when $x = 6$ and $y = 0.25$

22) Maximize $9x + 8y = f$ 22) _____
Subject to $x + 2y \le 2$
$3x + 2y \le 8$
$2x + 3y \le 10$
$x \ge 0, y \ge 0$

A) maximum: $f = 16$ when $x = 0, y = 2$
B) maximum: $f = 45$ when $x = 5, y = 0$
C) maximum: $f = 17$ when $x = 1, y = 1$
D) maximum: $f = 18$ when $x = 2, y = 0$

23) Maximize $f = 3x + 4y + 2z$ 23) _____
Subject to $x - 2y \le 12$
$3y + z \le 9$
$x + y - z \le 14$
$x \ge 0, y \ge 0, z \ge 0$

A) maximum: $f = \frac{187}{3}$ when $x = \frac{47}{3}$, $y = \frac{11}{6}$, $z = 4$

B) maximum: $f = 63$ when $x = \frac{47}{3}$, $y = 2$, $z = 4$

C) maximum: $f = \frac{175}{3}$ when $x = 15$, $y = \frac{11}{6}$, $z = 3$

D) maximum: $f = \frac{184}{3}$ when $x = \frac{47}{3}$, $y = \frac{11}{6}$, $z = \frac{7}{2}$

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

24) What are the coefficients of the objective function? 24) _____
A) 3, 6, 15 B) 2, 3, 1 C) 1, 2, 2 D) 2, 3, 2

25) What is the constraint for the assembling department? 25) _____
A) $A + 2B + 3C \le 30{,}000$
B) $2A + 3B + 2C \le 28{,}000$
C) $2A + 3B + 2B \le 38{,}000$
D) $2A + 3B + 2C \le 30{,}000$

Find the objective function and the constraints, and then solve the problem by using the simpex method

26) A company manufactures two ballpoint pens, silver and gold. Each silver pen requires 3 min in a grinder and 4 min in a bonder. Each gold pen requires 2 min in a grinder and 7 min in a bonder. The grinder can be run no more than 40 hours per week and the bonder no more than 63 hours per week. The company makes a $6 profit on each silver pen sold and $10 on each gold. How many of each type should be made each week to maximize profits? 26) _____

A) Maximize $f = 6x + 10y$
Subject to $3x + 4y \le 2400$
$2x + 7y \le 3780$
$x \ge 0, y \ge 0$

Maximum profit is $4800 when 800 silver and 0 gold pens are made

B) Maximize $f = 6x + 10y$
Subject to $3x + 2y \le 2400$
$4x + 7y \le 3780$
$x \ge 0, y \ge 0$

Maximum profit is $5400 when 0 silver and 540 gold pens are made

C) Maximize $f = 6x + 10y$
Subject to $3x + 2y \le 2400$
$4x + 7y \le 3780$
$x \ge 0, y \ge 0$

Maximum profit is $5600 when 710 silver and 134 gold pens are made

D) Maximize $f = 6x + 10y$
Subject to $3x + 4y \le 2400$
$2x + 7y \le 3780$
$x \ge 0, y \ge 0$

Maximum profit is $5400 when 0 silver and 540 gold pens are made

Find the specified matrix.

27) Find the dual matrix for the following linear programming problem. 27) _____

Minimize $f = 4x + y$
subject to $x + 5y \ge 6$
$3x + y \ge 6$
$x \ge 0, y \ge 0$

A)
$$\left[\begin{array}{cc|c} 1 & 3 & 4 \\ 5 & 1 & 1 \\ \hline 6 & 6 & 1 \end{array}\right]$$

B)
$$\left[\begin{array}{cc|c} -1 & -5 & -6 \\ -3 & -1 & -6 \\ \hline 4 & 1 & 0 \end{array}\right]$$

C)
$$\left[\begin{array}{cc|c} 1 & 3 & 4 \\ 5 & 1 & 1 \\ \hline 6 & 6 & 0 \end{array}\right]$$

D)
$$\left[\begin{array}{cc|c} 1 & 5 & 6 \\ 3 & 1 & 6 \\ \hline 4 & 1 & 0 \end{array}\right]$$

28) Find the dual matrix for the following linear programming problem. 28) _____

Maximize $f = -3x + 4y$

subject to $2x + y \geq 11$

$x + 2y \leq 12$

$x \geq 0, y \geq 0$

A)
$$\left[\begin{array}{cc|c} 2 & 1 & 11 \\ 1 & 2 & 12 \\ \hline -3 & 4 & 0 \end{array}\right]$$

B)
$$\left[\begin{array}{cc|c} -2 & 1 & -3 \\ -1 & 2 & 4 \\ \hline -11 & 12 & 0 \end{array}\right]$$

C)
$$\left[\begin{array}{cc|c} 2 & 1 & -3 \\ 1 & 2 & 4 \\ \hline 11 & 12 & 0 \end{array}\right]$$

D)
$$\left[\begin{array}{cc|c} -2 & -1 & -11 \\ 1 & 2 & 12 \\ \hline -3 & 4 & 0 \end{array}\right]$$

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

29) Minimize $w = 6x_1 + 3x_2$ 29) _____

subject to: $3x_1 + 2x_2 \geq 35$

$x_1 + 5x_2 \geq 39$

$x_1 \geq 0, x_2 \geq 0$

A) Maximize $z = 35y_1 + 39y_2$

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

$y_1 + 5y_2 \leq 3$

B) Maximize $z = 35y_1 + 39y_2$

subject to: $3y_1 + y_2 \geq 6$

$2y_1 + 5y_2 \geq 3$

C) Maximize $z = 35y_1 + 39y_2$

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

$2y_1 + 5y_2 \leq 3$

D) Maximize $z = -6y_1 - 3y_2$

subject to: $-3y_1 - 2y_2 \leq -35$

$-y_1 - 5y_2 \leq -39$

30) Minimize $z = 5x_1 + 7x_2$ 30) _____

Subject to: $9x_1 + 3x_2 \geq 205$

$x_1 + x_2 \geq 22$

$2x_1 + 6x_2 \geq 89$

$x_1 \geq 0, x_2 \geq 0$

A) Maximize $w = 205y_1 + 22y_2 + 89y_3$

Subject to: $9y_1 + y_2 + 2y_3 \leq 5$

$3y_1 + y_2 + 6y_3 \leq 7$

B) Maximize $w = -5y_1 - 7y_2$

Subject to: $-9y_1 - 3y_2 \leq -205$

$-y_1 - y_2 \leq -22$

$-2y_1 - 6y_2 \leq -89$

C) Maximize $w = 205y_1 + 22y_2 + 89y_3$

Subject to: $9y_1 + y_2 + 2y_3 \geq 5$

$3y_1 + y_2 + 6y_3 \geq 7$

D) Maximize $w = 89y_1 + 22y_2 + 205y_3$

Subject to: $2y_1 + y_2 + 9y_3 \leq 5$

$6y_1 + y_2 + 3y_3 \leq 7$

Find the transpose of the matrix.

31) $\begin{bmatrix} 3 & 4 & 4 \\ 2 & 1 & 3 \\ 9 & 8 & 7 \end{bmatrix}$ 31) _____

A) $\begin{bmatrix} 3 & 2 & 9 \\ 4 & 1 & 8 \\ 4 & 3 & 7 \end{bmatrix}$

B) $\begin{bmatrix} 4 & 4 & 3 \\ 1 & 3 & 2 \\ 8 & 7 & 9 \end{bmatrix}$

C) $\begin{bmatrix} 2 & 1 & 2 \\ 3 & 4 & 4 \\ 9 & 8 & 7 \end{bmatrix}$

D) $\begin{bmatrix} 9 & 8 & 7 \\ 2 & 1 & 3 \\ 3 & 4 & 4 \end{bmatrix}$

32) $\begin{bmatrix} 2 & 3 & 0 & 6 \\ 3 & 8 & 3 & 9 \\ 12 & 6 & 2 & 4 \\ 9 & 1 & 6 & 15 \end{bmatrix}$ 32) _____

A) $\begin{bmatrix} 6 & 9 & 4 & 15 \\ 0 & 3 & 2 & 6 \\ 3 & 8 & 6 & 1 \\ 1 & 3 & 12 & 9 \end{bmatrix}$

B) $\begin{bmatrix} 6 & 1 & 6 & 15 \\ 0 & 6 & 2 & 4 \\ 3 & 8 & 3 & 9 \\ 2 & 3 & 0 & 6 \end{bmatrix}$

C) $\begin{bmatrix} 2 & 3 & 12 & 9 \\ 3 & 8 & 6 & 1 \\ 0 & 3 & 2 & 6 \\ 6 & 9 & 4 & 15 \end{bmatrix}$

D) $\begin{bmatrix} 9 & 1 & 6 & 15 \\ 12 & 6 & 2 & 4 \\ 3 & 8 & 3 & 9 \\ 2 & 3 & 0 & 6 \end{bmatrix}$

Use the simplex method to solve the linear programming problem.

33) Minimize $w = 4y_1 + 4y_2$ 33) _____

subject to: $5y_1 + 10y_2 \geq 100$

$10y_1 + 20y_2 \geq 150$

$y_1 \geq 0, y_2 \geq 0$

A) 20 when $y_1 = 4$ and $y_2 = 4$

B) 60 when $y_1 = 0$ and $y_2 = 20$

C) 10 when $y_1 = 0$ and $y_2 = 50$

D) 40 when $y_1 = 0$ and $y_2 = 10$

34) Minimize $w = y_1 + 3y_2 + 2y_3$ 34) _____

subject to: $y_1 + y_2 + y_3 \geq 50$

$2y_1 + y_2 \geq 25$

$y_1 \geq 0, y_2 \geq 0, y_3 \geq 0$

A) 75 when $y_1 = 0$, $y_2 = 75$, and $y_3 = 50$

B) 12.5 when $y_1 = 1$, $y_2 = 2$, and $y_3 = 1$

C) 50 when $y_1 = 50$, $y_2 = 0$, and $y_3 = 0$

D) 87.5 when $y_1 = 0$, $y_2 = 0$, and $y_3 = 1$

Answer Key
Testname: 1324-2-REVIEW

1) D
2) C
3) A
4) C
5) C
6) C
7) D
8) C
9) D
10) D
11) A
12) D
13) B
14) B
15) C
16) A
17) C
18) B
19) D
20) A
21) C
22) D
23) D
24) A
25) D
26) C
27) C
28) B
29) C
30) A
31) A
32) C
33) D
34) C