Student: _____	**Instructor:** Yvette Butterworth	**Assignment:** Practice Test #3
Date: _____	**Course:** Finite Math (EVC Sp11)	
Time: _____	**Book:** Barnett: Finite Mathematics, 12e	

1. Find $(3)BA + (4)AC$, if possible.

$$A = \begin{bmatrix} 0 & -1 & -1 \\ 0 & 0 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0 \\ 0 & 5 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 2 \\ 0 & 0 & 3 \end{bmatrix}$$

Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

A. $(3)BA + (4)AC =$ $\begin{bmatrix} \square & \square & \square \\ \square & \square & \square \end{bmatrix}$

B. The matrix does not exist.

2. Find M^{-1}.

$$M = \begin{bmatrix} 1 & 1 & 0 \\ -1 & 1 & 1 \\ 0 & 3 & 1 \end{bmatrix}$$

$$M^{-1} = \begin{bmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{bmatrix}$$

3. Write the matrix equation as a system of equations.

$$\begin{bmatrix} 5 & -1 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -1 \\ 5 \end{bmatrix}$$

Complete the first equation of the system of equations.

$\square = -1$

Complete the second equation of the system of equations.

$\square = 5$

4. Write the system of equations as a matrix equation $AX = B$, with A as the coefficient matrix of the system.

$$x + 8y = -36$$
$$3x + 5y = -13$$

$$\begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \square \\ \square \end{bmatrix}$$

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5. Your screen print operation is doing extremely well at the craft shows. Last week you sold 50 tie-dyed shirts for \$15 each, 40 Cheraw-Tech crew shirts for \$10 each and 30 handpainted T-shirts for \$12 each. Use matrix operations to calculate your total revenue for the week.

A. \$1750

B. \$1151

C. \$1510

D. \$1480

6. Determine which of the following matrix equations represents the solution to the system:

$$2x_1 + x_2 = 2$$
$$5x_1 + 3x_2 = 13$$

A. $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 2 \\ 16 \end{bmatrix} \begin{bmatrix} 3 & -1 \\ -5 & 2 \end{bmatrix}$

B. $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix} \begin{bmatrix} 2 \\ 13 \end{bmatrix}$

C. $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 3 & -1 \\ -5 & 2 \end{bmatrix} \begin{bmatrix} 2 \\ 13 \end{bmatrix}$

D. $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 2 \\ 13 \end{bmatrix} \begin{bmatrix} -2 & -1 \\ -5 & -3 \end{bmatrix}$

7. Use graphical methods to solve the linear programming problem.

Maximize $z = 6x + 7y$ subject to $2x + 3y \le 12$, $2x + y \le 8$, $x \ge 0$, and $y \ge 0$.

A. Maximum of 24 when $x = 4$ and $y = 0$

B. Maximum of 52 when $x = 4$ and $y = 4$

C. Maximum of 32 when $x = 3$ and $y = 2$

D. Maximum of 32 when $x = 2$ and $y = 3$

8. Listed in the table are all the possible choices of nonbasic variables for the system

$$2x_1 + x_2 + s_1 = 5$$
$$x_1 + 2x_2 + s_2 = 4$$

In each case (A)-(F), find the values of each of the basic variables. Then, determine whether the basic solution is feasible.

	x_1	x_2	s_1	s_2
(A)	0	0		
(B)	0		0	
(C)	0			0
(D)		0	0	
(E)		0		0
(F)			0	0

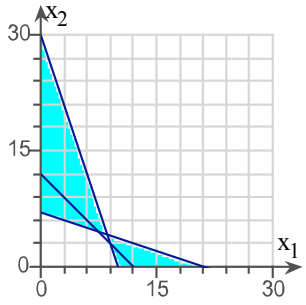
	x_1	x_2	s_1	s_2	Basic feasible solution (yes/no)?
(A)	0	0	☐	☐	☐
(B)	0	☐	0	☐	☐
(C)	0	☐	☐	0	☐
(D)	☐	0	0	☐	☐
(E)	☐	0	☐	0	☐
(F)	☐	☐	0	0	☐

9. Graph the system of inequalities. Introduce slack variables to convert the system of inequalities to a system of equations, and find all the basic solutions of the system. Complete the table listing each basic solution, the corresponding point on the graph, and whether the basic solution is feasible.

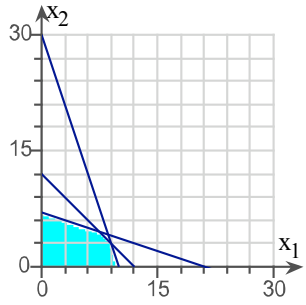
$$\begin{aligned} 3x_1 + x_2 &\le 30 \\ x_1 + x_2 &\le 12 \\ x_1 + 3x_2 &\le 21 \\ x_1, x_2 &\ge 0 \end{aligned}$$

Choose the correct graph of the system of inequalities below.

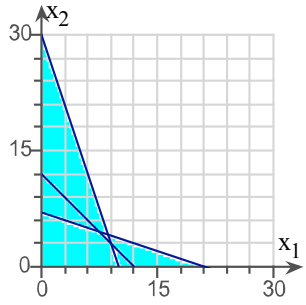
○ A.



○ B.



○ C.



Complete the table of basic solutions to the system of equations below.
(Simplify your answer. Type an ordered pair for each intersection point.)

x_1	x_2	s_1	s_2	s_3	Intersection point	Feasible?
0	0	30	12	21		
0		0				
0			0			
0				0		
	0	0				
	0		0			
	0			0		
		0	0			
		0		0		
			0	0		

10. Consider the simplex tableau given below.

x_1	x_2	s_1	s_2	P	
1	5	0	3	0	11
0	−2	1	5	0	13
0	−2	0	5	1	12

(A) Which variables are basic variables?

- x_2, s_2, and P
- x_1, s_1, and s_2
- x_2, s_1, and s_2
- x_1, s_1, and P

Which variables are nonbasic variables?

- x_2 and s_1
- s_2 and P
- s_1, and s_2
- x_2 and s_2

(B) Find the corresponding values from the tableau above.

$x_1 =$ ☐ Determine the value of x_1.

$x_2 =$ ☐ Determine the value of x_2.

$s_1 =$ ☐ Determine the value of s_1.

$s_2 =$ ☐ Determine the value of s_2.

P = ☐ Determine the value of P.

(C) Which of the following is true?

- A. An additional pivot is required.
- B. The optimal solution has been found
- C. The problem has no optimal solution.

10.

(cont.)

11. Write the basic solution for the following simplex tableau.

x_1	x_2	x_3	s_1	s_2	P	
3	4	0	3	1	0	20
1	5	1	7	0	0	28
−3	4	0	1	0	1	20

A. $x_1, x_2, s_1 = 0, x_5 = 28, s_2 = 20, P = 20$

B. $x_1, x_2, s_1 = 0, x_3 = 28, s_2 = 20, P = 20$

C. $x_1, x_2, s_1 = 0, x_1 = 28, s_2 = 20, P = 20$

D. $x_1, x_2, s_1 = 0, x_3 = 20, s_2 = 28, P = 20$

12. Solve the linear programming problem using the simplex method.

Maximize $P = 30x_1 + 40x_2$

subject to $2x_1 + x_2 \le 50$
$x_1 + x_2 \le 35$
$x_1 + 2x_2 \le 60$
$x_1, x_2 \ge 0$

Use the simplex method to solve the problem. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

A. The maximum value of P is ☐ when $x_1 =$ ☐ and $x_2 =$ ☐.

B. There is no optimal solution.

13. An investor has at most $80,000 to invest in government bonds, mutual funds, and money market funds. The average yields for the government bonds, mutual funds, and money market funds are 5%, 11%, and 12% respectively. The investor's policy requires that the total amount invested in mutual and money market funds not exceed the amount invested in government bonds. How much should be invested in each type of investment in order to maximize the return? What is the maximum return in the first year?

How much should be invested in government bonds?

$

How much should be invested in mutual funds?

$

How much should be invested in money market funds?

$

What is the maximum return in the first year?

$

14. Minimize $C = 2x_1 + 8x_2$

subject to $8x_1 + 2x_2 \geq 7$
$8x_1 + 5x_2 \geq 7$
$x_1, x_2 \geq 0$

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a. Form the dual problem.

Maximize $P = \square\, y_1 + \square\, y_2$

subject to $\square\, y_1 + \square\, y_2 \leq \square$
$\square\, y_1 + \square\, y_2 \leq \square$
$y_1, y_2 \geq 0$

b. Using the slack variables of x_1 and x_2, write the initial system for the dual problem.

$\square\, y_1 + \square\, y_2 + x_1 = \square$
$\square\, y_1 + \square\, y_2 + x_2 = \square$
$\square\, y_1 + \square\, y_2 + P = 0$

c. Fill in the initial simplex tableau for the dual problem.

	y_1	y_2	x_1	x_2	P	
x_1	☐	☐	☐	☐	☐	☐
x_2	☐	☐	☐	☐	☐	☐
P	☐	☐	☐	☐	☐	☐

15. In the following problem, a minimization problem, the corresponding dual problem, and the final simplex tableau in the solution of the dual problem are given.

Minimize	$C = 15x_1 + 36x_2$	Maximize	$P = 36y_1 + 51y_2$
subject to	$2x_1 + 5x_2 \geq 36$	subject to	$2y_1 + 3y_2 \leq 15$
	$3x_1 + 7x_2 \geq 51$		$5y_1 + 7y_2 \leq 36$
	$x_1, x_2 \geq 0$		$y_1, y_2 \geq 0$

y_1	y_2	x_1	x_2	P	
0	1	5	−2	0	3
1	0	−7	3	0	3
0	0	3	6	1	261

a. Find the optimal solution of the dual problem

Maximum of P = ☐
y_1 = ☐
y_2 = ☐

b. Find the optimal solution of the minimization problem.

Minimum of C = ☐
x_1 = ☐
x_2 = ☐

16. Minimize $C = 19x_1 + 2x_2$
subject to $4x_1 + x_2 \geq 33$
$3x_1 + x_2 \geq 8$
$x_1, x_2 \geq 0$

a. Form the dual problem.

Maximize $P =$ ☐ $y_1 + 8y_2$
subject to ☐ $y_1 +$ ☐ $y_2 \leq 19$
$y_1 +$ ☐ $y_2 \leq$ ☐
$y_1, y_2 \geq 0$

b. Find the solution to the original problem by applying the simplex method to the dual problem. Select the correct choice below and fill in any answer boxes within your choice.

○ Min C = ☐ at x_1 = ☐ and x_2 = ☐
○ The optimal solution does not exist.