1. Which one of the following points falls in the solution region of the following system?

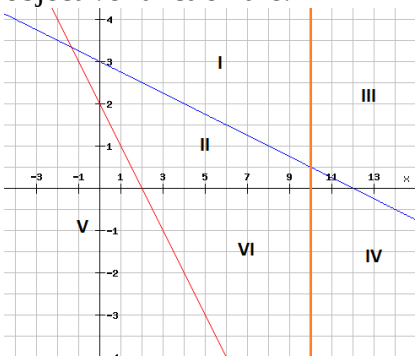
$$\begin{cases} 2x + y \geq 6 \\ x - y \geq 3 \end{cases}$$

a. $(3, -2)$
b. $(6,\ 0)$
c. $(0, 0)$
d. $(3,\ 5)$
e. $(1,\ 4)$

2. For the following linear programing problem

$$\begin{aligned} &Maxmize && Z = x + 5y \\ &subject\ to && x + 4y \leq 12 \\ & && x \leq\ 8 \\ & && x + y \geq 2 \\ & && x \geq 0,\ \ y \geq 0 \end{aligned}$$

The feasible region-that is bounded by all lines around it -and the optimum value of the objective function are:



a. Region II and 15
b. Region I and 15
c. Region II and 8
d. Region III and 12
e. Region VI and 10

3. Consider the following linear programing problem:

$$\begin{cases} Minimize & Z = x + 2y \\ \\ subject\ to & x + y \geq 1 \\ & 2x + 4y \geq 3 \\ & x \geq 0,\ \ y \geq 0 \end{cases}$$

The minim value of Z occurs at:

a. All points on the line segment joining $\left(\frac{1}{2},\frac{1}{2}\right)$ and $\left(\frac{3}{2},0\right)$
b. $(0,1)$
c. $\left(\frac{1}{2},\frac{1}{2}\right)$
d. $\left(\frac{3}{2},0\right)$
e. $(0,0)$

4. The values of x_1, x_2, x_3 that maximize Z and its maximum value are (***Hint***: Use simplex method).

$$\begin{cases} Maxmize & Z = 3x_1 + 4x_2 + 2x_3 \\ \\ subject\ to & 3x_1 + x_2 + 4x_3 \leq 5 \\ & x_1 - x_2 \leq 3 \\ & 2x_1 - x_2 + x_3 \leq 6 \\ & ,x_2, x_3 \geq 0, \end{cases}$$

a. $x_1 = 0, x_2 = 5, x_3 = 0, Z = 20$
b. $x_1 = 9, x_2 = 0, x_3 = 6, Z = 39$
c. $x_1 = 5, x_2 = 10, x_3 = 11, Z = 77$
d. $x_1 = 4, x_2 = 0, x_3 = 0, Z = 12$
e. $x_1 = 0, x_2 = 0, x_3 = 11, Z = 22$

5. A jean manufacturer makes three types of jeans, each of which goes through three manufacturing phases: cutting, sewing, and finishing. The number of minutes each type of product requires in each of the three phases is given below:

Jean	Cutting	Sewing	Finishing
I	8	12	4
II	12	18	8
III	18	24	12

There are 5200 minutes of cutting time, 6000 minutes of sewing time, and 2200 minutes of finishing time each day. The company can sell all the jeans it makes and makes a profit of \$4 on each Jean I, \$4.50 on each Jean II, and \$6 on each Jean III. If $x_1 \geq 0$,$x_2 \geq 0$, $x_3 \geq 0$, and Z, are respectively the number of jeans form type I, II, III and the profit, then the linear programming problem that shows the number of jeans in each category should be made each day to maximize profits is given by:

a.
$$Maxmize \quad Z = 4x_1 + 4.5x_2 + 18x_3$$
$$subject\ to \quad 8x_1 + 12x_2 + 18x_3 \leq 5200$$
$$12x_1 + 18x_2 + 24x_3 \leq 6000$$
$$4x_1 + 8x_2 + 12x_3 \leq 2200$$

b.
$$Maxmize \quad Z = 8x_1 + 12x_2 + 4x_3$$
$$subject\ to \quad 4x_1 + 12x_2 + 18x_3 \leq 5200$$
$$4.5x_1 + 18x_2 + 24x_3 \leq 6000$$
$$18x_1 + 8x_2 + 12x_3 \leq 2200$$

c.
$$Maxmize \quad Z = 5200x_1 + 6000x_2 + 2200x_3$$
$$subject\ to \quad 8x_1 + 12x_2 + 18x_3 \leq 4$$
$$12x_1 + 18x_2 + 24x_3 \leq 4.5$$
$$4x_1 + 8x_2 + 12x_3 \leq 18$$

d.
$$Maxmize \quad Z = 8x_1 + 12x_2 + 18x_3$$
$$subject\ to \quad 4x_1 + 4.5x_2 + 18x_3 \leq 5200$$
$$12x_1 + 18x_2 + 24x_3 \leq 6000$$
$$4x_1 + 8x_2 + 12x_3 \leq 2200$$

e.
$$Maxmize \quad Z = 4x_1 + 4.5x_2 + 18x_3$$
$$subject\ to \quad 8x_1 + 12x_2 + 18x_3 \geq 5200$$
$$12x_1 + 18x_2 + 24x_3 \geq 6000$$
$$4x_1 + 8x_2 + 12x_3 \geq 2200$$

6. The values of x_1, x_2 that minimize C and its minimum value are (***Hint:*** *Use the dual and simplex method*)

$$\text{Minimize} \quad C = 6x_1 + 3x_2$$

$$\text{subject to} \quad x_1 + x_2 \geq 4$$
$$3x_1 + 4x_2 \geq 2$$
$$x_1, x_2 \geq 0,$$

a. $x_1 = 0, x_2 = 4, C = 12$
b. $x_1 = 3, x_2 = 0, C = 18$
c. $x_1 = 3, x_2 = 4,\ C = 30$
d. $x_1 = 4, x_2 = 0, C = 24$
e. $x_1 = 0, x_2 = 3,\ C = 9$

7. For the following linear programming problem

$$\text{Minimize} \quad Z = 2x_1 + 2x_2$$

$$\text{Subject to} \quad x_1 + 4x_2 \geq 28$$
$$2x_1 - x_2 \geq 2$$
$$-3x_1 + 8x_2 \geq 16$$
$$x_1, x_2 \geq 0$$

The last simplex table for the dual is:

	y_1	y_2	y_3	s_1	s_2	W	R
y_2	0	1	$-20/9$	$4/9$	$-1/9$	0	$2/3$
y_1	1	0	$13/9$	$1/9$	$2/9$	0	$2/3$
W	0	0	20	4	6	1	??

Then the solution for the system is:

a. $x_1 = 4, x_2 = 6, Z = 20$
b. $x_1 = 2/3, x_2 = 2/3, Z = 8/3$
c. $x_1 = 0, x_2 = 0,\ Z = 0$
d. $x_1 = 4, x_2 = 0, Z = 8$
e. $x_1 = 0, x_2 = 6,\ Z = 12$

8. Using the simplex method find the pivot element in the initial simplex table if the objective function is

$$\text{Maximize} \quad Z = 8x_1 + 10x_2 + 7x_3$$

$$\begin{aligned} & & x_1 + 3x_2 + 2x_3 \le 10 \\ & \textit{Subject to} & x_1 + 5x_2 + x_3 \le 8 \\ & & x_1, x_2, x_3 \ge 0 \end{aligned}$$

a. 5
b. 3
c. 1
d. 2
e. 8

9. Find the dual of the following problem

$$\begin{aligned} & \textit{Minimize} & Z = 2y_1 - 3y_2 \\ & & -y_1 + 2y_2 \le -10 \\ & \textit{Subject to} & 4y_1 + 3y_2 \ge 5 \\ & & 2y_1 - 3y_2 \ge 7 \\ & & y_1, y_2 \ge 0 \end{aligned}$$

a. $\textit{Maximize} \quad W = 2x_1 - 3x_2$

$$\begin{aligned} & & -x_1 + 2x_2 \le -10 \\ & \textit{Subject to} & 4x_1 + 3x_2 \ge 5 \\ & & 2x_1 - 3x_2 \ge 7 \\ & & x_1, x_2 \ge 0 \end{aligned}$$

b. $\textit{Minimize} \quad W = 10x_1 + 5x_2 + 7x_3$

$$\begin{aligned} & & x_1 - 2x_2 - x_3 \ge 10 \\ & \textit{Subject to} & -2x_1 + 3x_2 - 3x_3 \ge -3 \\ & & x_1 + 4x_2 + 2x_3 \ge 2 \\ & & x_1, x_2, x_3 \ge 0 \end{aligned}$$

c. $\textit{Maximize} \quad W = 10x_1 + 5x_2 + 7x_3$

$$\begin{aligned} & & 2x_1 - 3x_2 + 3x_3 \ge 3 \\ & \textit{Subject to} & x_1 + 4x_2 + 2x_3 \le 2 \\ & & x_1, x_2, x_3 \ge 0 \end{aligned}$$

d. $\textit{Maximize} \quad W = 2x_1 - 3x_2$

$$-2x_1 + 3x_2 - 3x_3 \le -3$$
$$\textit{Subject to} \quad x_1 + 4x_2 + 2x_3 \le 2$$
$$x_1, x_2, x_3 \ge 0$$

e. $\textit{Minimize} \quad W = 10x_1 + 5x_2 + 7x_3$

$$-2x_1 + 3x_2 - 3x_3 \ge -3$$
$$\textit{Subject to} \quad x_1 + 4x_2 + 2x_3 \ge 2$$
$$x_1, x_2, x_3 \ge 0$$

10. To what sum will $2000 in eight years if invested at a rate of 6% compounded quarterly for the first four years and at a rate of 6% compounded semiannually thereafter.

a. $3215.02
b. $3187.69
c. $3209.41
d. $3220.64
e. $2247.20

11. A debt of $5000 due in four years from now and $5000 due ten years from now is to be repaid by a payment of $2000 at the end of the second year, a payment of $4000 at the end of four years, and a final payment at the end of six years. If the interest rate is 2.5% compounded annually, how much is the final payment?

a. $3372.74
b. $3723.34
c. $3839.87
d. $3407.13
e. $3511.07

12. An initial investment of SR 2,000 yields yearly cash flows of SR 500, SR 500, SR 600, SR 600, and SR 440 at the end of each year. If the market interest rate is 12% compounded annually, the net present value of this investment is

a. SR -96.92
b. SR -249.67
c. SR -381.31
d. SR -427.07
e. SR -398.60

13. What annual rate r compounded continuously is equivalent to a nominal rate of 6% compounded semiannually?

a. 5.91%
b. 6%
c. 5.84%

d. 6.09%
e. 6.16%

14. Suppose a person has an investment of $40,000 in a business that guarantees the same cash flow at the end of every quarter for six years. If the investment earns interest at the rate of 12% compounded quarterly, then each cash flow is

a. $2361.89
b. $2530.07
c. $3289.70
d. $2713.12
e. $1901.75

15. Suppose Khalid invests in a business by depositing $3000 at the beginning of every tax year for the next 12 years. If the interest rate is 7.5% compounded annually, how much will Khalid have at the end of 12 years?

a. $59416.52
b. $52271.18
c. $62416.52
d. $55271.18
e. $56416.52

16. An annuity consisting of equal payments of $250 payable at the end of every quarter for ten years. Assume a rate of 5% compounded quarterly, find the future value of this annuity.

a. $12872.39
b. $12622.39
c. $7831.73
d. $8081.73
e. $7929.63

17. What effective rate is equivalent to a nominal rate of 8.4% compounded monthly?

a. 8.73%
b. 8.66%
c. 8.57%
d. 8.76%
e. 8.54%

18. A student won a University prize. He will receive a check for 2,500 SR at the beginning of each quarter for 6 years. To provide all these payments, the University purchased an annuity at 8% compounded quarterly. How much did the annuity cost the university?

a. $47134.60
b. $47284.81
c. $44784.81
d. $48230.51
e. $73554.66

19. Find the annual rate of interest that will double the money in 3 years when compounded semi-annually?

a. 24.5%
b. 25.5%
c. 23.5%
d. 23.8%
e. 26.5%

20. If you deposit SR 1000 in a bank account with interest rate of 6% compounded semi-annually, after how many years will you have SR 2500?

a. 15.5
b. 19
c. 23.5
d. 27
e. 31