

I Find the values of x and y that minimize or maximize the objective functions for each feasible region. Also find the value of the maximum or minimum.

1. Identify the vertices, then maximize $P = 3x + 2y$

Vertices: $(0, 0)$, $(4, 0)$, $(0, 8)$, $(2, 2)$

Max is $\frac{18}{At (4, 0)}$

2. Identify the vertices, then minimize $C = 4x + 2y$

Vertices: $(1, 1)$, $(4, 3)$, $(1, 3)$

Min is $\frac{22}{At (4, 3)}$

Graph each system of restrictions.

3. $y \leq 8$
 $y \geq 0, x \geq 0$

4. $1 \leq x \leq 3$
 $2x + y \leq 8$

5. Watch the scales on each axis. List the restrictions for the following graph.

Restrictions: $0 \leq y \leq 5$
 $x \geq 0$

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 $x \geq 0$

6. A gold processor has two sources of gold ore, source A and source B. In order to keep his plant running, at least three tons of ore must be processed each day. Ore from source A costs \$20 per ton to process, and ore from source B costs \$10 per ton to process. Costs must be kept to less than \$80 per day. Moreover, Federal Regulations require that the amount of ore from source B cannot exceed twice the amount of ore from source A. If one from source A yields 2 oz. of gold per ton, and one from source B yields 3 oz. of gold per ton, how many tons of ore from both sources must be processed each day to maximize the amount of gold extracted subject to the above constraints?

X: Source A y : Source B

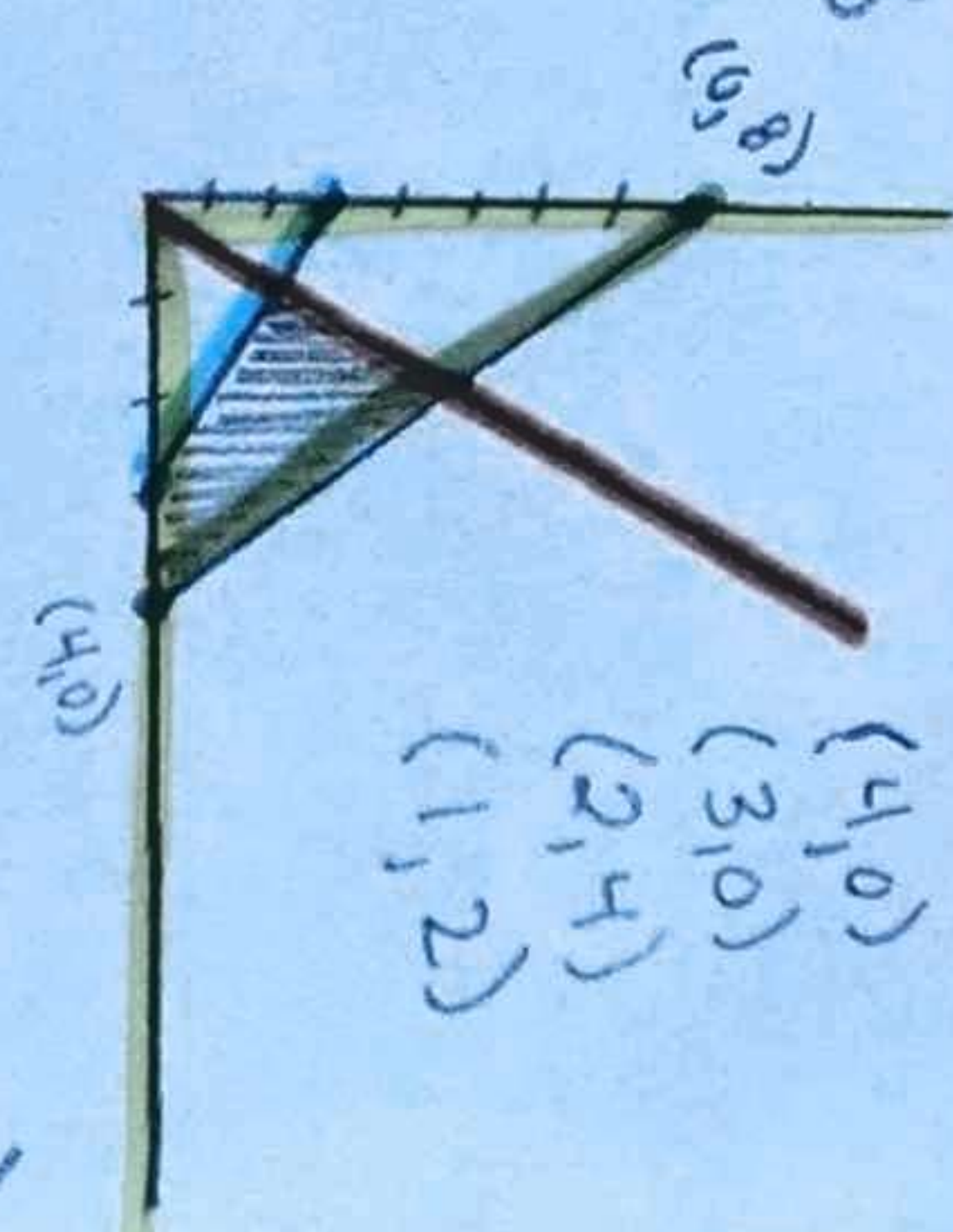
$x + y \geq 3$

$20x + 10y \leq 80$

$y \leq 2x$

$x \geq 0, y \geq 0$

Objective function: $P = 2x + 3y$ Max of 16 at $(2, 4)$



State the dimensions and identify the indicated element of each matrix.

7. $\begin{bmatrix} 2 \\ -3 \\ -6 \end{bmatrix}$ a_{21} -3

8. $\begin{bmatrix} 5 & -7 & 23 & 10 \\ -9 & 3 & 5 & -2 \\ 1 & 9 & 0 & 2 \end{bmatrix}$ a_{33} 5

9. $\begin{bmatrix} x & y & z \\ d & e & f \\ p & q & r \end{bmatrix}$ a_{32} q

10. Use the equivalent matrices to solve for each variables.

$\begin{bmatrix} a & 2b \\ c-2 & d+3 \end{bmatrix} = \begin{bmatrix} 5 & -7 \\ 10 & 10 \end{bmatrix}$

$a = 5$
 $b = -7/2$
 $c = 12$
 $d = 7$

11. a) Rewrite the data from the table in a matrix where the years are the rows and the categories are the columns.

	June 1992	June 1996
Construction	17.6%	9.5%
Manufacturing	8.3%	5.1%
Transportation	5.4%	4.5%
Sales	8.7%	6.4%
Finance	4.0%	2.6%
Services	6.6%	5.1%
Government	3.5%	2.7%

(b) Identify a_{21} and what it represents.
(c) Identify a_{16} and what it represents.

8.3% current unemployment in the manufacturing sector

Solve each matrix...

12. $X = \begin{bmatrix} 0 & 0 & 1 \\ 1 & -2 & -2 \\ -2 & -3 & 3 \end{bmatrix} = \begin{bmatrix} 3 & 12 & 1 \\ -6 & -4 & 2 \\ -3 & 6 & 7 \end{bmatrix}$

$X = \begin{bmatrix} 3 & 12 & 2 \\ -5 & -6 & 0 \\ -5 & 3 & 10 \end{bmatrix}$

13. $2X = \begin{bmatrix} -4 & 24 \\ 7 & 15 \end{bmatrix}$

$X = \begin{bmatrix} -2 & 12 \\ 7/2 & 15/2 \end{bmatrix}$

Use the provided matrices to find the following, if possible. You may use your graphing calculator.

14. $A = \begin{bmatrix} 1 & -1 \\ 3 & -2 \end{bmatrix}$ 2×2 not possible	$B = \begin{bmatrix} 0 & 2 \\ -2 & 1 \\ -1 & 0 \end{bmatrix}$ 3×2	$C = \begin{bmatrix} 3 & -3 & -1 \\ 2 & -2 & 4 \end{bmatrix}$ 2×3	$D = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ 2×2	$E = \begin{bmatrix} 3 \\ -3 \\ 2 \end{bmatrix}$ 3×1
$F = \begin{bmatrix} 10 & -1 \\ 0 & 2 \\ -3 & 5 \end{bmatrix}$ 3×2	15. $B - 3F$ $\begin{bmatrix} 30 & 5 \\ -2 & -5 \\ 8 & -15 \end{bmatrix}$ 3×2	16. EC $\begin{bmatrix} 3 & -3 & -1 \\ 2 & -2 & 4 \end{bmatrix} \begin{bmatrix} 3 \\ -3 \\ 2 \end{bmatrix}$ 2×3 not possible	17. $CB - 5A$ $\begin{bmatrix} 2 & 8 \\ -15 & 12 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - 5 \begin{bmatrix} 1 & -1 \\ 3 & -2 \end{bmatrix}$ 2×2 not possible	18. $2D$ $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ 2×2
19. CE $\begin{bmatrix} 10 \\ 20 \end{bmatrix} \begin{bmatrix} 3 & -3 & -1 \\ 2 & -2 & 4 \end{bmatrix}$ 2×1 not possible	20. A^2 $\begin{bmatrix} 1 & -1 \\ 3 & -2 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 3 & -2 \end{bmatrix}$ 2×2	21. C^2 $\begin{bmatrix} 3 & -3 & -1 \\ 2 & -2 & 4 \end{bmatrix} \begin{bmatrix} 3 & -3 & -1 \\ 2 & -2 & 4 \end{bmatrix}$ 2×3 not possible	22. $B \cdot C$ $\begin{bmatrix} 0 & 2 \\ -2 & 1 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} 3 & -3 & -1 \\ 2 & -2 & 4 \end{bmatrix}$ 3×2 not possible	23. $2A \cdot C$ $2 \begin{bmatrix} 1 & -1 \\ 3 & -2 \end{bmatrix} \begin{bmatrix} 3 & -3 & -1 \\ 2 & -2 & 4 \end{bmatrix}$ 2×2 not possible

Use a calculator to find the inverse of each matrix, if it exists.

24. $A^{-1} = \begin{bmatrix} 6 & 2 \\ 2 & 1 \end{bmatrix}$	25. $A^{-1} = \begin{bmatrix} 1 & 3 & -1 \\ 0 & 1 & -2 \\ -1 & 2 & 1 \end{bmatrix}$	26. $A^{-1} = \begin{bmatrix} \frac{1}{2} & -1 \\ -1 & 3 \end{bmatrix}$	27. $A^{-1} = \begin{bmatrix} 1 & 1 & -1 \\ 0 & 2 & -1 \\ 1 & 3 & 0 \end{bmatrix}$
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Solve for matrix X.

26. $\begin{bmatrix} 3 & 5 \\ 6 & 2 \end{bmatrix} X = \begin{bmatrix} -2 & 6 \\ 4 & 12 \end{bmatrix}$ $X = \begin{bmatrix} 1 & a \\ -1 & 0 \end{bmatrix}$	27. $\begin{bmatrix} 1 & 1 & -1 \\ 0 & 2 & -1 \\ 1 & 3 & 0 \end{bmatrix} X = \begin{bmatrix} -1 \\ 2 \\ 1 \end{bmatrix}$ $X = \begin{bmatrix} -2 \\ 1 \\ 0 \end{bmatrix}$
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28. Write as a matrix equation. Then solve by inverse matrices. $3x + 5y = 4$
 $2x - 7y = 13$

$$\begin{bmatrix} 3 & 5 \\ 2 & -7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 13 \end{bmatrix}$$

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

29. Write as a matrix equation. Then solve by inverse matrices. $3x - y + 2z = 4$
 $x + 5z = -13$
 $2x + 2y - z = -1$

$$\begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 5 \\ 2 & 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ -13 \\ -1 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ -4 \\ -3 \end{bmatrix} \quad (2, -4, -3)$$

30. Write a system of equations, then write a matrix equation to solve.

On Monday, Mr. Graff bought 8 packs of yellow chalk and 4 packs of white chalk for \$7.40. On Tuesday, Mrs. Graff went to the same store and bought 6 packs of yellow and 12 packs of white chalk for \$10.50. How much does each type of chalk cost?

$$8y + 4w = 7.40$$

$$6y + 12w = 10.50$$

$$(.65, .55)$$

\$0.65 for yellow chalk
\$0.55 for white chalk

32. Solve the system of 3 equations by hand

$$\begin{cases} -6x - 5y + 4z = 53 \\ 5x + 3y + 2z = -11 \\ 8x - 6y + 5z = 4 \end{cases}$$

$$(-4, -1, 0)$$

31.

Jenny has 10 fewer quarters than dimes and five fewer nickels than quarters. The total value of the coins is \$4.75. Write a system of 3 equations and solve for the number of nickels, dimes, and quarters Jenny has in her possession.

$$\begin{cases} Q = D - 10 \\ Q = N + 5 \\ .05N + .1D + .25Q = 4.75 \end{cases}$$

$$\begin{bmatrix} 0 & -1 & 1 \\ -1 & 0 & 1 \\ .05 & .1 & .25 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -10 \\ 5 \\ 4.75 \end{bmatrix}$$

5 nickels, 20 dimes, 10 quarters

33. Solve the system of 3 equations by hand

$$\begin{cases} a - 3b + c = 43 \\ 3a - 6b + 9c = 5 \\ 4a - 9b + 10c = 9 \end{cases}$$

no solution

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