#6 WS Matrices and Linear Programming Name_____

Use the following matrices to simplify each, if possible. If not possible, state why.

$A=\begin{bmatrix}4 & -3\\ 7 & 1\end{bmatrix}$	$B=\begin{bmatrix}6\\ 2\end{bmatrix}$	$C=\begin{bmatrix}8\\ 4\\ 1\end{bmatrix}$	$D=\begin{bmatrix}0 & 4 & -2\\ 3 & -9 & -4\end{bmatrix}$	$E=\begin{bmatrix}7 & -9\\ 0 & -2\end{bmatrix}$	$F=[5 \quad -8]$

1. A + B N.P	2. E - A $\begin{bmatrix}3 & -6\\ -7 & -3\end{bmatrix}$	3. 4D $\begin{bmatrix}0 & 16 & -8\\ 12 & -36 & -16\end{bmatrix}$	4. 3B-2C $2\times1 - 3\times1$ N.P.
5. DB $2\times\cancel{3}\ \cancel{2}\times1$ NP	6. BD N.P.	7. BA $2\times\cancel{1}\ \cancel{2}\times2$ N.P.	8. CD $3\times\cancel{1}\ \cancel{2}\times3$ NP
9. A^2 $\begin{bmatrix}-5 & -15\\ 35 & -20\end{bmatrix}$	10. C^2 N.P.	11. -2(BF) $\begin{bmatrix}60 & 96\\ -20 & 32\end{bmatrix}$	12. F(A+E) $[-1 \quad -52]$

Multiple each matrix.

13. $\begin{bmatrix}6 & 3 & 2\end{bmatrix}\cdot\begin{bmatrix}w\\ x\\ y\end{bmatrix}$

$\begin{matrix}6w\\ 3x\\ 2y\end{matrix} = [6w+3x+2y]$

14. $\begin{bmatrix}-7 & 2\\ -3 & -1\end{bmatrix}\cdot\begin{bmatrix}a & b\\ c & d\end{bmatrix}$ $\begin{bmatrix}-7a+2c & -7b+2d\\ -3a-1c & -3b-1d\end{bmatrix}$

$-7\cdot a = -7a \quad -7\cdot b$
$2\ c = 2c \quad 2\cdot d$
$-3\cdot a = -3a \quad -3\cdot b$
$-1\cdot c = -1c \quad -1\cdot d$

15. If $A\cdot B = P$, give the value of P_{21}. Row1 x Col1

$A\cdot B = P$

$\begin{bmatrix}3 & 2\\ 10 & -12\end{bmatrix}\cdot\begin{bmatrix}w & x\\ y & z\end{bmatrix} = \begin{matrix}10w=10w\\ -12y=-12y\end{matrix}$

Rows C1 B C2

$10w-12y$

Solve each:

16. $\begin{bmatrix}12 & x & 3y+4\\ 36 & -15 & 32\end{bmatrix} = \begin{bmatrix}12 & 3x-10 & 25\\ z^2 & -15 & w+y\end{bmatrix}$

$x = 3x-10$
$-3x \quad -3x$
$-2x = -10$
$x = 5$

$3y+4 = 25$
$3y = 21$
$y = 7$

$z^2 = 36$
$z = 6$

$32 = w+7$
$-7 \quad -7$
$25 = w$

17. $\begin{bmatrix}3x-1 & 23\\ y-5 & 2w\end{bmatrix} = \begin{bmatrix}20 & 23\\ -10 & 0\end{bmatrix}$

$3x-1 = 20$
$+1 \quad +1$
$3x = 21$
$x = 7$

$y-5 = -10$
$y = -5$

$2w = 0$
$w = 0$

18. $X+\begin{bmatrix}3 & -7\\ 9 & 0\end{bmatrix}=\begin{bmatrix}13 & 17\\ 24 & 30\end{bmatrix}$

$-\begin{bmatrix}3 & -7\\ 9 & 0\end{bmatrix}\quad -\begin{bmatrix}3 & -7\\ 9 & 0\end{bmatrix}$

$=\begin{bmatrix}10 & 24\\ 15 & 30\end{bmatrix}$

19. $\frac{3X}{3}=\begin{bmatrix}30/3 & 15/3\\ 24/3 & -7/3\end{bmatrix}$

$X=\begin{bmatrix}10 & 5\\ 8 & -7/3\end{bmatrix}$

20. $X\begin{bmatrix}12 & -3\\ 8 & 6\end{bmatrix}=\begin{bmatrix}51\\ 26\end{bmatrix}\cdot A^{-1}$

A^{-1}

$X=\begin{bmatrix}4\\ -1\end{bmatrix}$

21. $X\begin{bmatrix}8 & -9 & 0\\ 3 & -2 & -5\\ 1 & 5 & 12\end{bmatrix}=\begin{bmatrix}18\\ 5\\ 13\end{bmatrix}$

$\begin{bmatrix}1143/377\\ 262/377\\ 204/377\end{bmatrix}$

22. $5x+2y=-26$

$-8x-y=35$

$\begin{bmatrix}5 & 2\\ -8 & -1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-26\\ 35\end{bmatrix}$

$\begin{matrix}x\\ y\end{matrix}=\begin{bmatrix}-4\\ -3\end{bmatrix}$

23. $83x-15y=604$

$24x+32y=320$

$\begin{bmatrix}83 & -15\\ 24 & 32\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}604\\ 320\end{bmatrix}$

$\begin{matrix}x\\ y\end{matrix}=\begin{bmatrix}8\\ 4\end{bmatrix}$

Write a system for each, then solve using matrices

24. The football game playoff game costs $5 per student and $8 per adult. 1,020 people attended the game and the revenue collected was $6150. How many students and adult tickets were sold?

$5x+8y=6150$

$x+y=1020$

$\begin{bmatrix}5 & 8\\ 1 & 1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}6150\\ 1020\end{bmatrix}$

$x=670$

$y=350$

25. At Chiquita's Smoothie Bar, Brian bought 36 bananas on Monday and 21 apples for $10.53. On Tuesday he bought 30 bananas and 27 apples for $10.77. What is the cost of each banana and each apple (assume they cost the same each day)?

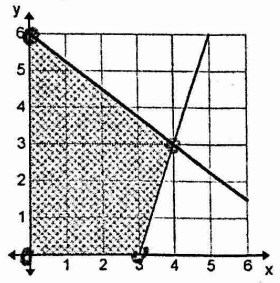
$36x+21y=10.53$ $\quad x=.17$

$30x+27y=10.77$ $\quad y=.21$

$\begin{bmatrix}36 & 21\\ 30 & 27\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}10.53\\ 10.77\end{bmatrix}$

Use Linear Programing to complete each.

26. A) Give the vertices of the shaded region.



Vertices of Shaded Region:

(0,0), (0,6)

(3,0), (4,3)

C) Find the Maximum for $P=5x-y$ (Show your work!)

$(0,0)=0$ $\quad (0,6)=-6$

$(3,0)=15$ $\quad (4,3)=17$

Maximum of P is 17 and occurs at the vertex (4,3).

D) Find the Minimum for $C=3x-2y$ (Show your work!)

$(0,0)=0$ $\quad (0,6)=-12$

$(3,0)=9$ $\quad (4,3)=6$

Minimum of C is -12 and occurs at the vertex (0,6).

27. A calculator company produces a scientific calculator and a graphing calculator. Long-term projections indicate an expected demand of at least 100 scientific and 80 graphing calculators each day. Because of limitations on production capacity, no more than 200 scientific and 170 graphing calculators can be made daily. To satisfy a shipping contract, a total of at least 200 calculators must be shipped each day. Write the restrictions for the above information.

$x+y\geq 200$

$100x+80y\leq 370$

If each scientific calculator sold results in a $2 loss, but each graphing calculator produces a $5 profit, how many of each type should be made daily to maximize net profits?

$2x+5y$