Key

Matrix Review

Part I. These questions should be done <u>without</u> a Graphing Calculator.

$A=\begin{bmatrix}2 & 0 & -1\end{bmatrix}$ $B=\begin{bmatrix}1 & 2 & 4\\ -2 & 1 & 0\end{bmatrix}$ $C=\begin{bmatrix}1/2 & 3\\ 2 & 3/2\\ -2 & 1\end{bmatrix}$

$D=\begin{bmatrix}1 & 4\\ 0 & -1\\ 2 & 0\end{bmatrix}$ $F=\begin{bmatrix}5\end{bmatrix}$ $G=\begin{bmatrix}4 & 0 & 2\\ -1 & 1 & 0\\ 7 & 5 & 0\end{bmatrix}$

State the order of the Given Matrix.

1. A 1×3

2. D 3×2

Carry out the indicated operation, or explain why it cannot be performed.

3. $2C+3D$ $\begin{bmatrix}4 & 18\\ 4 & 0\\ 2 & 2\end{bmatrix}$

4. $5B-2C$ NOT POSSIBLE DIMENSIONS ARE $\neq$ $(2\times 3)\cdot(1\times 3)$ $3\neq 1$

5. FA $\begin{bmatrix}10 & 0 & -5\end{bmatrix}$

6. BA NOT POSSIBLE

7. BC $\begin{bmatrix}-\frac{7}{2} & 10\\ 1 & -\frac{9}{2}\end{bmatrix}$

8. CB $\begin{bmatrix}-1\frac{1}{2} & 4 & 2\\ -1 & 1\frac{1}{2} & 8\\ -4 & -3 & -8\end{bmatrix}$

9. G^2 $\begin{bmatrix}30 & 10 & 8\\ -5 & 1 & -2\\ 23 & 5 & 14\end{bmatrix}$

10. $G(2C-D)$ $G\begin{bmatrix}0 & 2\\ 4 & 4\\ -6 & 2\end{bmatrix}$ $\begin{bmatrix}-12 & 12\\ 4 & 2\\ 20 & 34\end{bmatrix}$

11. Find the determinate of $A=\begin{bmatrix}1 & 4\\ 2 & 9\end{bmatrix}$. 1

12. Find the determinate of $A=\begin{bmatrix}1 & 2 & 3\\ 2 & 5 & 3\\ 1 & 0 & 8\end{bmatrix}$ -1

Find A^{-1}, the inverse of matrix A if possible.

13. $A=\begin{bmatrix}1 & 4\\ 2 & 9\end{bmatrix}$ $A^{-1}=\begin{bmatrix}9 & -4\\ -2 & 1\end{bmatrix}$

14. $A=\begin{bmatrix}4 & -12\\ -2 & 6\end{bmatrix}$ $\varnothing$

15. $A=\begin{bmatrix}1 & 2 & 3\\ 2 & 5 & 3\\ 1 & 0 & 8\end{bmatrix}$ $A^{-1}=\begin{bmatrix}-40 & 16 & 9\\ 13 & -5 & -3\\ 5 & -2 & -1\end{bmatrix}$

Part II. Systems. These questions should be done <u>without</u> a Graphing Calculator.

16. Solve the system $\begin{aligned}12x-5y&=10\\ 5x-2y&=17\end{aligned}$ $(65, 154)$

a) RREF $\begin{bmatrix}1 & 0 & 65\\ 0 & 1 & 154\end{bmatrix}$

b) By expressing the system as a matrix equation and by multiplying each side by the inverse of the coefficient matrix.

$\begin{bmatrix}12 & -5\\ 5 & -2\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}10\\ 17\end{bmatrix}$ $\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-2 & 5\\ -5 & 12\end{bmatrix}\begin{bmatrix}10\\ 17\end{bmatrix}$ $\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}65\\ 154\end{bmatrix}$

$A*\begin{bmatrix}x\\ y\end{bmatrix}$

$\begin{aligned}x+y-z&=-1\\ 4x-3y+2z&=16\\ 2x-2y-3z&=5\end{aligned}$

17. Given the above system use Cramer's Rule to find the solution for the y value. $\frac{-62}{31}$ $y=-2$

18. Use RREF to solve the system. $\begin{bmatrix}1 & 0 & 0 & 2\\ 0 & 1 & 0 & -2\\ 0 & 0 & 1 & 1\end{bmatrix}$ $(2, -2, 1)$

19. Write a matrix equation i.e. $[A]X=[B]$ of the above system. <u>Do Not Solve.</u>
(matrix A should be 3x3 X is 3x1 and matrix B is 3x1)

$\begin{bmatrix}1 & 1 & -1\\ 4 & -3 & 2\\ 2 & -2 & -3\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}-1\\ 16\\ 5\end{bmatrix}$

$A * X = B$

Part II. Let your fingers do the typing and use a graphing calculator <u>after</u> you set up each of the following problems. Give evidence of your solutions.

20. Find A^{-1} using a calculator. Solve the system in problem #19.

$X = A^{-1} * B$

$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -2 \\ 1 \end{bmatrix}$ $(2, -2, 1)$

21. At noon, an indestructible car is seen going due West on the wrong side of I-80 at 75 mph. At 12:15 a truck capable of destroying everything in its path is seen in the same lane as the car going East at 80 mph. They are 135 miles apart. When will this unexplainable crash happen?

1:00 P.M.

	R	T	D
CAR	75	t	$75t$
TRUCK	80	$t-\frac{1}{4}$	$80t-20$

$75t + 80t - 20 = 135$

$155t = 155$

22. Julie has $20,000 to invest. As her financial consultant, you recommend that she invest in Treasury bills that yield 5%, Treasury bonds that yield 7%, and corporate bonds that yield 9%. Julie wants to have an annual income of $1280, and the amount invested in Treasury bills must be two times the amount invested in corporate bonds. Find the amount in each investment.

$\begin{bmatrix} 1 & 1 & 1 & 20{,}000 \\ .05 & .07 & .09 & 1280 \\ 1 & 0 & -2 & 0 \end{bmatrix}$

$12,000 TREAS. BILLS

$2,000 TREAS. BONDS

$6,000 CORP. BONDS

23. To paint motorcycles it requires painting, drying, and polishing. MAK Graphics paints three types of bikes, the "Low Rider", the "Sturgis" and the "Daytona". Each Low Rider requires 10 hours for painting, 3 hours for drying and 2 hours for polishing. A Sturgis requires 16 hours for painting, 5 hours for drying and 3 hours for polishing. A Daytona requires 8 hours for painting, 2 hours for drying and 1 hours for polishing. If the company has 240 hours for painting, 69 hours for drying, and 41 hours for polishing per month, how many of each type of motorcycle are completed.

$\begin{bmatrix} 10 & 16 & 8 & 240 \\ 3 & 5 & 2 & 69 \\ 2 & 3 & 1 & 41 \end{bmatrix}$

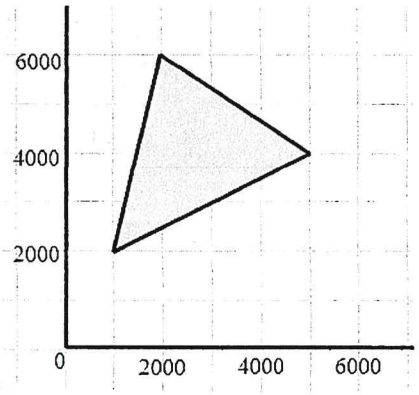
8 LOW RIDERS

5 STURGIS'

10 DAYTONAS

24. An outdoor club is purchasing land to set up a conservation area. The last remaining piece they need to buy is the triangular plot shown in the figure. Use the determinant formula for the area of a triangle to find the area of the plot of land.

$$Area = \pm\frac{1}{2}\begin{vmatrix} a_1 & b_1 & 1 \\ a_2 & b_2 & 1 \\ a_3 & b_3 & 1 \end{vmatrix}$$



AREA $= \pm\frac{1}{2}\begin{bmatrix} 1000 & 2000 & 1 \\ 5000 & 4000 & 1 \\ 2000 & 6000 & 1 \end{bmatrix}$

7,000,000 square units

25. "We R Cheap" Yugo has two locations, one in the city and another in the suburbs. In June, the city location sold 400 subcompacts, 250 intermediate-size cars, and 50 family roadsters; in July, it sold 350 subcompacts, 100 intermediate-size cars, and 30 family roadsters. At the suburban location in June, 450 subcompacts, 200 intermediate-size cars, and 140 family roadsters were sold. In July, it sold 350 subcompacts, 300 intermediate-size cars, and 100 family roadsters.

a) Find 2 by 3matrices that summarize the sales data for each location for June and July(one matrix for each month).

JUNE $\begin{bmatrix} 400 & 250 & 50 \\ 450 & 200 & 140 \end{bmatrix}$ JULY $\begin{bmatrix} 350 & 100 & 30 \\ 350 & 300 & 100 \end{bmatrix}$

b) Use matrix addition to obtain total sales for the two month period.

$\begin{bmatrix} 750 & 350 & 80 \\ 800 & 500 & 240 \end{bmatrix}$

c) The profit on each kind of car is \$129 per subcompact, \$ 134 per intermediate, and \$332 per family roadster. Find a 3 by 1 matrix representing this profit.

$\begin{bmatrix} 129 \\ 134 \\ 332 \end{bmatrix}$

d) Multiply the matrices found in parts (b) and (c) to get the profit at each location.

$\begin{bmatrix} 170,210 \\ 249,880 \end{bmatrix}$

CITY PROFIT \$ 170,210

SUBURBAN PROFIT \$ 249,880