Unit 1 Test Review

name________________

Date________ Per.______

NGC= No Graphing Calculator

Perform the indicated operations given the matrices below.

$A = \begin{bmatrix} -1 & 2 & 4 \\ 2 & -3 & 5 \end{bmatrix}$ $B = \begin{bmatrix} -2 & 1 & 5 \\ 6 & 2 & -2 \\ -10 & 0 & 5 \end{bmatrix}$ $C = \begin{bmatrix} 2 & 0 & -1 \\ -5 & 5 & 1 \\ 3 & 0 & -4 \end{bmatrix}$ $D = \begin{bmatrix} 4 & 1 \\ 3 & 2 \\ 0 & 5 \end{bmatrix}$ $E = \begin{bmatrix} -4 & -4 \\ 1 & 2 \end{bmatrix}$

$F = \begin{bmatrix} 4 & 6 \\ 2 & 3 \end{bmatrix}$ $G = \begin{bmatrix} -5 \\ 1 \\ 2 \end{bmatrix}$ $H = \begin{bmatrix} 2 & -1 & 8 \end{bmatrix}$ $J = \begin{bmatrix} 2 & 4 & 6 \\ -3 & 5 & 1 \\ -4 & 0 & 0 \end{bmatrix}$

1. det (E) **NGC

$\begin{bmatrix} -4 & -4 \\ 1 & 2 \end{bmatrix} = -8-(-4) = -4$

1. -4

2. E^{-1} **NGC

$\frac{1}{-8-(-4)}\begin{bmatrix} 2 & 4 \\ -1 & -4 \end{bmatrix} = \frac{1}{-4}\begin{bmatrix} 2 & 4 \\ -1 & -4 \end{bmatrix}$

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

3. Which product exists AC or ~~CA~~? $2\times3 \; 3\times3$ $3\times3 \; 2\times3$
Also, find the product that does exist. **NGC

3. AC; $\begin{bmatrix} 0 & 10 & -13 \\ 34 & -15 & -25 \end{bmatrix}$

$\begin{bmatrix} -1 & 2 & 4 \\ 2 & -3 & 5 \end{bmatrix}\begin{bmatrix} 2 & 0 & -1 \\ -5 & 5 & 1 \\ 3 & 0 & -4 \end{bmatrix} = \begin{bmatrix} -1(2)+2(-5)+4(3) & -1(0)+2(5)+4(0) & -1(-1)+2(1)+4(-4) \\ 2(2)+-3(-5)+5(3) & 2(0)+-3(5)+5(0) & 2(-1)+-3(1)+5(-4) \end{bmatrix}$

$= \begin{bmatrix} 0 & 10 & -13 \\ 34 & -15 & -25 \end{bmatrix}$

4. $|J|$ by ~~expansion of minors~~ **NGC

$\left|\begin{matrix} 2 & 4 & 6 \\ -3 & 5 & 1 \\ -4 & 0 & 0 \end{matrix}\right| \begin{matrix} 2 & 4 \\ -3 & 5 \\ -4 & 0 \end{matrix}$

$2(5)(0)+4(1)(-4)+6(-3)(0)-(-4)(5)(6)-0(1)(2)-0(-3)(4)$

$0+(-16)+0-(-120)-0-0$

104

4. 104

5. $|B|$ using diagonal method **NGC

$\left|\begin{matrix} -2 & 1 & 5 \\ 6 & 2 & -2 \\ -10 & 0 & 5 \end{matrix}\right| \begin{matrix} -2 & 1 \\ 6 & 2 \\ -10 & 0 \end{matrix}$

$-2(2)(5)+1(-2)(-10)+5(6)(0)-(-10)(2)(5)-0(-2)(-2)-5(6)(1)$

$-20+20+0-(-100)-0-30$

70

5. 70

6. 3C − 2J **NGC

$3\begin{bmatrix} 2 & 0 & -1 \\ -5 & 5 & 1 \\ 3 & 0 & -4 \end{bmatrix} - 2\begin{bmatrix} 2 & 4 & 6 \\ -3 & 5 & 1 \\ -4 & 0 & 0 \end{bmatrix}$

6. $\begin{bmatrix} 2 & -8 & -15 \\ -9 & 5 & 1 \\ 17 & 0 & -12 \end{bmatrix}$

$\begin{bmatrix} 6 & 0 & -3 \\ -15 & 15 & 3 \\ 9 & 0 & -12 \end{bmatrix} - \begin{bmatrix} 4 & 8 & 12 \\ -6 & 10 & 2 \\ -8 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 2 & -8 & -15 \\ -9 & 5 & 1 \\ 17 & 0 & -12 \end{bmatrix}$

7. Change the following system of equations into a matrix equation.

$5x + 3y = 4$
$3x + 2y = 0$

7. $\begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 0 \end{bmatrix}$

8. Find the inverse of the coefficient matrix.

$3x - y = 0$
$5x + 2y = 22$

$\begin{bmatrix} 3 & -1 \\ 5 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 22 \end{bmatrix}$

$\frac{1}{3(2)-5(-1)}\begin{bmatrix} 2 & 1 \\ -5 & 3 \end{bmatrix} = \frac{1}{11}\begin{bmatrix} 2 & 1 \\ -5 & 3 \end{bmatrix} = \begin{bmatrix} \frac{2}{11} & \frac{1}{11} \\ -\frac{5}{11} & \frac{3}{11} \end{bmatrix}$

8. $\begin{bmatrix} \frac{2}{11} & \frac{1}{11} \\ -\frac{5}{11} & \frac{3}{11} \end{bmatrix}$

9. Using matrix algebra, solve the system of equations.

$3x - y = 5$
$x + 2y = 4$

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

$\begin{bmatrix} 3 & -1 & 5 \\ 1 & 2 & 4 \end{bmatrix}$ 2x3 rref

$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

9. x = 2
y = 1

10. Find the parabola through the points (-4, 26), (-2, 0), and (2,4).

$\begin{bmatrix} 16 & -4 & 1 \\ 4 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 26 \\ 0 \\ 4 \end{bmatrix}$

$\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} \frac{7}{3} \\ 1 \\ -\frac{22}{3} \end{bmatrix}$

$\boxed{y = \frac{7}{3}x^2 + x - \frac{22}{3}}$

11. Find the area of a triangle 1defined by the points (-4, 26), (-2, 0), and (2,4).

$A = \pm\frac{1}{2}\begin{vmatrix} -4 & 26 & 1 \\ -2 & 0 & 1 \\ 2 & 4 & 1 \end{vmatrix} = \frac{1}{2}(112) = \boxed{56}$

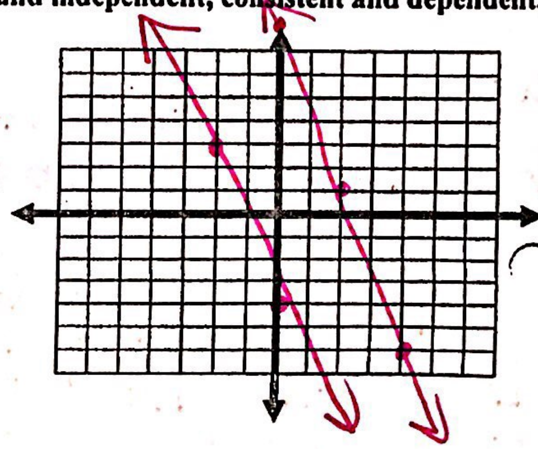
****For problems 12-14 state whether the system is consistent and independent, consistent and dependent, or inconsistent and neither****

12. Solve the following system of equations by **graphing**

$7x + 2y = 16$
$-21x - 6y = 24$

$2y = -7x + 16$
$y = -\frac{7}{2}x + 8$

$-6y = 21x + 24$
$y = -\frac{7}{2}x - 4$



$\boxed{\text{N.S.}}$ Inconsistent

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13. Solve the following system of equations by **substitution**

$$12x - 3y = 6$$
$$4x - y = 2$$

$-y = -4x + 2$

$y = 4x - 2$

$12x - 3(4x - 2) = 6$

$12x - 12x + 6 = 6$

$6 = 6$

$\boxed{\text{IMS}}$

Consistent & dependent

14. Solve the following system of equations by **elimination**

$3(4x - 3y = 25)$
$4(-3x + 8y = 10)$

$12x - 9y = 75$
$-12x + 32y = 40$

$23y = 115$

$y = 5$

$4x - 3(5) = 25$

$4x - 15 = 25$

$4x = 40$

$x = 10$

$\boxed{(10, 5)}$

Consistent & independent

$A = \begin{bmatrix} 2 & 4 \\ 4 & -8 \end{bmatrix}$ $B = \begin{bmatrix} 5 & -2 \\ 1 & 3 \end{bmatrix}$ $C = \begin{bmatrix} 3 & 4 & -6 \\ 1 & 0 & 8 \\ -5 & -1 & -4 \end{bmatrix}$ $D = \begin{bmatrix} 1 \\ 5 \\ -12 \end{bmatrix}$ $E = \begin{bmatrix} 8 & 5 & 6 \\ 3 & -3 & 7 \\ -2 & -3 & 0 \end{bmatrix}$ $F = \begin{bmatrix} 2 & -5 \\ 3/4 & 10 \end{bmatrix}$

15. CD

$$\begin{bmatrix} 3 & 4 & -6 \\ 1 & 0 & 8 \\ -5 & -1 & -4 \end{bmatrix}\begin{bmatrix} 1 \\ 5 \\ -12 \end{bmatrix} = \begin{bmatrix} 95 \\ -95 \\ 38 \end{bmatrix}$$

15. $\begin{bmatrix} 95 \\ -95 \\ 38 \end{bmatrix}$

16. 2A – 1/3B + F

$$2\begin{bmatrix} 2 & 4 \\ 4 & -8 \end{bmatrix} - \frac{1}{3}\begin{bmatrix} 5 & -2 \\ 1 & 3 \end{bmatrix} + \begin{bmatrix} 2 & -5 \\ \frac{3}{4} & 10 \end{bmatrix} =$$

16. $\begin{bmatrix} \frac{13}{3} & \frac{11}{3} \\ \frac{101}{12} & -7 \end{bmatrix}$

17. Use matrices to solve the following system of equations

$$\begin{cases} 2w - x + 5y + z = -3 \\ 3w + 2x + 2y - 6z = -32 \\ w + 3x + 3y - z = -47 \\ 5w - 2x - 3y + 3z = 49 \end{cases}$$

$$\begin{bmatrix} 2 & -1 & 5 & 1 \\ 3 & 2 & 2 & -6 \\ 1 & 3 & 3 & -1 \\ 5 & -2 & -3 & 3 \end{bmatrix}\begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -3 \\ -32 \\ -47 \\ 49 \end{bmatrix}$$

w = 2

x = -12

y = -4

z = 1

E

Name ____________________ Date __________

Enrichment: For use after Lesson 5.8, Algebra 2 with Trigonometry

Food for Thought

For each of the following problems, set up and solve a system of three equations in three unknowns to determine the quantity of food needed.

X = bread
Y = meat
Z = cherse

1. A delicatessen delivers a gigantic sandwich for the members of a jury who have been unable to reach a verdict. The sandwich of bread, meat, and cheese, costs $0.60 per lb for the bread, $3.00 per lb for the meat, and $1.50 per lb for the cheese. A pound of bread supplies 10 g of protein, a pound of meat supplies 50 g of protein, and a pound of cheese supplies 40 g of protein. If each member of the jury eats a pound of sandwich, receives 30 g of protein, and pays $1.50, how much of each ingredient went into the sandwich?

$x+y+z=1$
$.6x+3y+1.5z=1.50$
$10x+50y+40z=30$

$$\begin{bmatrix} 1 & 1 & 1 \\ .6 & 3 & 1.5 \\ 10 & 50 & 40 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}=\begin{bmatrix} 1 \\ 1.50 \\ 30 \end{bmatrix}$$

5/12 of bread, 1/4 of meat, 1/3 of cheese

2. Paella is a classic Spanish fiesta dish made from chicken, rice, and shellfish. A pound of chicken costs $1.00 and supplies 100 g of protein. A pound of rice costs 50¢ and supplies 20 g of protein. A pound of shellfish costs $3.00 and supplies 50 g of protein. If the resulting paella weighs 18 lb, costs $19.00, and supplies 850 g of protein, how much rice, chicken, and shellfish were used?

X = chicken
y = rice
z = shellfish

$x+y+z=18$
$x+.5y+3=19$
$100x+20y+50z=850$

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & .5 & 3 \\ 100 & 20 & 50 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}=\begin{bmatrix} 18 \\ 19 \\ 850 \end{bmatrix}$$

5 lbs of chicken, 10 lbs of rice & 3 lbs of shellfish

3. The local yogurt bar features a banana treat made up of 2 lb of bananas, 3 lb of topping, and 4 lb of frozen yogurt, at a cost of $19.00. A pound of topping costs a dollar less than a pound of frozen yogurt, which costs as much as $\frac{1}{2}$ lb of topping and 4 lb of bananas. How much does a pound of each ingredient cost?

OMIT

4. The banana treat in Exercise 3 contains 5900 calories. The calories in a pound of topping are half of the calories in a pound of frozen yogurt. Two lb of topping and 5 lb of bananas supply the same amount of calories as 2 lb of frozen yogurt. What is the caloric content of a pound of each of the items?

OMIT