

1.) Evaluate  $\frac{1}{2} \begin{vmatrix} 0 & -2 & 1 \\ -1 & 4 & 1 \\ 3 & 5 & 1 \end{vmatrix}$

$$\frac{1}{2} |(0 + -6 + -5) - (12 + 0 + 2)| = \frac{25}{2}$$

Area is always positive.

Choice B

2.)  $A^T = \begin{bmatrix} -1 & 2 \\ 1 & 0 \\ -2 & 1 \end{bmatrix}$

$$A^T B = \begin{bmatrix} 5 & 4 \\ -3 & 0 \\ 7 & 2 \end{bmatrix}$$

Choice C

3.) Using elementary row operations:

$$\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$$

Choice D

4.)

$$(ax^2 + c) - (-bx)$$

$$ax^2 + bx + c$$

Choice D

5.)

$$C_{21} = - \begin{vmatrix} 9 & 4 \\ 7 & -6 \end{vmatrix} = 82$$

Choice D

6.)

$$(2x - 25 - 8) - (5x - 4 - 20)$$

$$-3x - 9 = 0$$

$$x = -3$$

Choice C

7.)

$$\begin{bmatrix} 3 & x \\ -2 & -3 \end{bmatrix} = \begin{bmatrix} \frac{-3}{-9+2x} & \frac{-x}{-9+2x} \\ \frac{2}{-9+2x} & \frac{3}{-9+2x} \end{bmatrix}$$

$$3 = \frac{-3}{-9+2x}$$

$$x = 4$$

Choice A

8.) Solving for X:

$$X = \frac{1}{2}B - \frac{3}{2}A; \quad X = \begin{bmatrix} 3 & 3 \\ -\frac{1}{2} & 0 \\ -\frac{13}{2} & \frac{11}{2} \end{bmatrix}$$

Choice C

9.) There are two values for x, but one which works is 16/5:

$$\frac{1}{2}[(-10-2) - (-4-5x)] = 4$$

$$x = \frac{16}{5}$$

Choice A

10.)

$$\begin{vmatrix} 4 & x \\ -2 & -3 \end{vmatrix} = 0; \quad -12 + 2x = 0; \quad x = 6$$

Choice A

11.)

$$3e^{5x} - 2e^{5x} = e^{5x}$$

Choice A

12.)

$$\begin{bmatrix} 0 & -i^2 \\ i^2 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$

Choice B

13.)

$$2x + 1 = 5$$

$$x = 2$$

$$4 = 3y - 5$$

$$y = 3$$

$$2 + 3 = 5$$

Choice E

14.)

$$\begin{bmatrix} 0 & -1 & 0 \\ 4 & 0 & 2 \\ 8 & -1 & 7 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ -3 & 4 \\ 1 & 6 \end{bmatrix} = \begin{bmatrix} 3 & -4 \\ 15 & 16 \\ 26 & 46 \end{bmatrix}$$

Choice D

15.) Using the definition of Cramer's Rule:

$$x = \frac{\begin{vmatrix} -7 & 8 \\ -37 & -5 \end{vmatrix}}{\begin{vmatrix} 3 & 8 \\ 9 & -5 \end{vmatrix}}$$

Choice B

16.)

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

$$\begin{bmatrix} 4-4x & 2x-x \\ 4 & 4x+1 \end{bmatrix} = \begin{bmatrix} 2 & x \\ 4 & -1 \end{bmatrix}$$

$$x = -\frac{1}{2}$$

Choice C

17.) Using back substitution:

$$z = -3$$

$$y + z = 9$$

$$x + 2y - 2z = -1$$

$$x = 29$$

$$y = 12$$

$$z = -3$$

$$3x + y - z = 102$$

Choice D

18.) Expansion by minors

$$3 \begin{vmatrix} -1 & 2 \\ 0 & 3 \end{vmatrix} = 3(-3) = -9$$

Choice B

19.)

$$\begin{bmatrix} 2 & 1 \\ 6 & 0 \end{bmatrix} \begin{bmatrix} 2 & 6 \\ -3 & 5 \end{bmatrix} = \begin{bmatrix} 1 & 17 \\ 12 & 36 \end{bmatrix}$$

Choice A

20.)

$$2 \log_3 x - \log_2 16 = 0$$

$$\log_3 x = 2$$

$$x = 3^2 = 9$$

Choice A

21.) The determinant is equal to zero, so the inverse is undefined.

Choice C

22.)

$$M_{22} = \begin{vmatrix} 1 & 0 \\ 4 & 4 \end{vmatrix}$$

Choice C

23.)

$$\begin{bmatrix} 18 & -3 \\ 6 & 12 \\ -9 & 15 \end{bmatrix} - \begin{bmatrix} 2 & 8 \\ -2 & 10 \\ 2 & 20 \end{bmatrix} = \begin{bmatrix} 16 & -11 \\ 8 & 2 \\ -11 & -5 \end{bmatrix}$$

Choice B

24.)

$$\begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix} = \begin{bmatrix} 9 & 6 \\ 12 & 12 \end{bmatrix}$$

Choice B

25.) Expansion by minors

$$-2 \begin{vmatrix} 4 & 7 \\ 3 & 1 \end{vmatrix} = 34$$

Choice D

26.)

$$\begin{bmatrix} 1 & 9 \\ 9 & 4 \end{bmatrix}^2 = \begin{bmatrix} 82 & 45 \\ 45 & 97 \end{bmatrix}; \begin{bmatrix} 82 & 45 \\ 45 & 97 \end{bmatrix} + \begin{bmatrix} 1 & 9 \\ 9 & 4 \end{bmatrix} = \begin{bmatrix} 83 & 54 \\ 54 & 101 \end{bmatrix}$$

$$\begin{vmatrix} 83 & 54 \\ 54 & 101 \end{vmatrix} = 8383 - 2916 = 5467$$

Choice C

27.)  $B$  is  $A$ 's inverse, so  $AB=I$

Choice E

28.)

$$\begin{vmatrix} x-1 & 2 \\ 3 & x-2 \end{vmatrix} = 0$$

$$x^2 - 3x - 4 = 0$$

$$x = -1 \text{ or } 4$$

Choice C

29.) Find the value of the determinant and set

$$\text{equal to } b. \quad -1 \begin{vmatrix} 2 & a \\ 1 & -5 \end{vmatrix} - 2 \begin{vmatrix} 1 & 2 \\ 2 & a \end{vmatrix} = b;$$

$$-1(-10 - a) - 2(a - 4) = b;$$

$$10 + a - 2a + 8 = b; a = 18 - b$$

Choice C

30.) Dimensions of the matrices are different, thus you can not add or subtract the matrices.

Choice D