

E3 Show all relevant work

Q1 a) Sketch the graph for $\frac{(x+2)^2}{9} + \frac{(y-4)^2}{25} = 1$

b) Label all intercepts

c) Label all foci.

d) Label all vertices

e) Find the lengths of the major and minor axes

f) Find the eccentricity.

Q2 a) Sketch the graph for $4(x+1)^2 + (y+3)^2 = 1$

b) Label the foci.

c) Label the vertices

d) Label the endpoints of the minor axis

Q3 Find the center, vertices, and asymptotes of the hyperbola with equation $4x^2 - 5y^2 + 40x - 30y - 45 = 0$

Q4 Sketch the graph of the hyperbola with center $(2, 3)$, vertex $(0, 3)$, and focus $(5, 3)$

Q5 Find an equation for the hyperbola with vertices at $(-2, 15)$ and $(-2, -1)$, and having eccentricity $e = \frac{17}{8}$.

Q6 Find the vertex, focus, directrix, axis of symmetry, and latus rectum for $y-1 = \frac{1}{4}(x+2)^2$

Q7 Find an equation for the circle centered at $(-5, 12)$ and passing through the point $(-2, 8)$.

Q8 Find an equation for the circle centered at $(1, -5)$ and tangent to the line $3x + 4y = 8$.

Q9 Solve the following system:

$$3x + y - 6z = -10$$

$$2x + y - 5z = -8$$

$$6x - 3y + 3z = 0$$

Q10 Solve the following system:

$$x + z = 1$$

$$x + y + z = 2$$

$$x - y + z = 1$$

Q11 Solve using Gaussian elimination:

$$2x + y + 3z = 1$$

$$2x + 6y + 8z = 3$$

$$6x + 8y + 18z = 5$$

Q12 Solve using Cramer's Rule

$$2x + y + z = 3$$

$$x - y - z = 0$$

$$x + 2y + z = 0$$

Q13 Let $A = \begin{bmatrix} 1 & 0 & -2 \\ 0 & 3 & -1 \end{bmatrix}$ $B = \begin{bmatrix} 0 & 3 \\ -2 & -1 \\ 0 & 4 \end{bmatrix}$

Show that $AB \neq BA$

Q14 You receive a coded message. You know that each letter of the original message was replaced with a one- or two-digit number corresponding to its placement in the English alphabet, so "E" is represented by "5" and "W" by "23"; spaces in the message are indicated by zeroes. The message was also transformed (encoded) by multiplying the message on the left by the matrix

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

Translate the

coded message M into text where

$$M = \begin{bmatrix} 108 & 8 & 26 & 95 & 69 & 3 \\ 79 & 0 & 13 & 95 & 76 & 1 \\ 238 & 40 & 79 & 114 & 60 & 11 \end{bmatrix}$$

Q15 Use determinants and cofactors to find the inverse of

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

Q16 Find the determinant for

$$B = \begin{vmatrix} 2 & 3 & 1 \\ -1 & -6 & 7 \\ 4 & 5 & -1 \end{vmatrix}$$

Q17 Determine the partial fraction decomposition for $\frac{3x^3 + 7x - 4}{(x^2 + 2)^2}$

Q18 Determine the partial fraction decomposition for $\frac{4x^2}{x^3 - 5x^2 + 8x - 4}$

Q19. Sketch the solution for $x^2 + y^2 < 25$
 $x^2 + (y - 3)^2 \geq 10$

Q20. A 15-foot ladder is leaning against a wall so that the distance from the bottom of the ladder to the wall is one-half of the distance from the top of the ladder to the ground. Find the distance from the top of the ladder to the ground.

