



MATH 103 - General Mathematics Final Examination

1) Open the parentheses and simplify the following expressions:

a) $\frac{(4x^2 + 2x)^2}{(2x)^2}$

b) $\frac{(\sqrt{40} + \sqrt{4})(\sqrt{40} - \sqrt{4})}{3\sqrt{12}}$

2) Sketch the graphs of the following parabolas:

a) $y = x^2 - 6x - 7$

b) $y = -x^2 + 100$

3) Multiply the following matrices: (If possible)

a) $\begin{bmatrix} 3 & 2 & -1 \\ 1 & 0 & 4 \end{bmatrix} \begin{bmatrix} 5 & 4 & 8 \\ 6 & -2 & 11 \\ 0 & -3 & 1 \end{bmatrix}$

b) $\begin{bmatrix} 6 & 3 & 4 & 8 \\ 1 & 0 & 5 & -1 \end{bmatrix} \begin{bmatrix} 9 & 1 & 3 & 0 \\ 10 & 6 & 5 & 1 \\ 0 & -7 & 14 & -8 \end{bmatrix}$

4) Find the determinant of the following matrices:

a) $A = \begin{bmatrix} 10 & 25 \\ 3 & 12 \end{bmatrix}$

b) $B = \begin{bmatrix} 1 & 4 & 5 \\ 0 & 3 & 9 \\ 2 & 1 & -1 \end{bmatrix}$

5) Solve the following system of equations using inverse matrix:

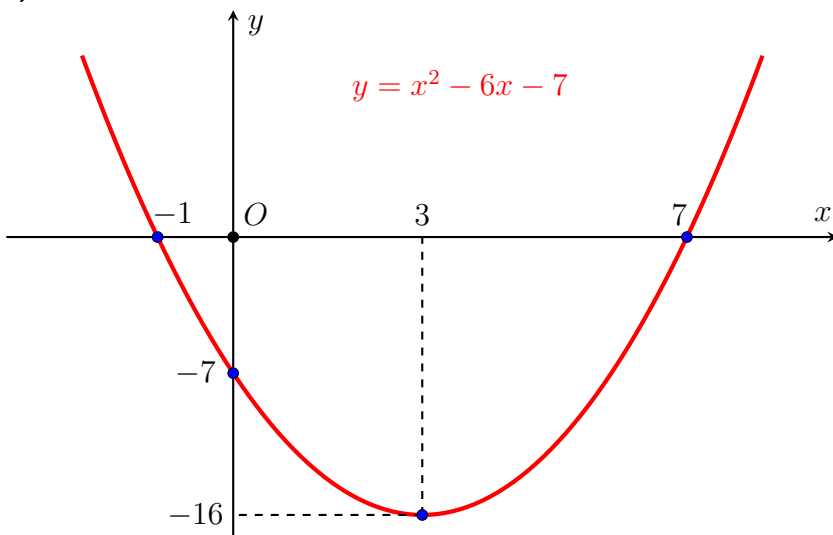
$$\begin{aligned} 3x + 4y &= 8 \\ -2x + 3y + 2z &= -1 \\ 7x + 6y - z &= 17 \end{aligned}$$

ANSWERS

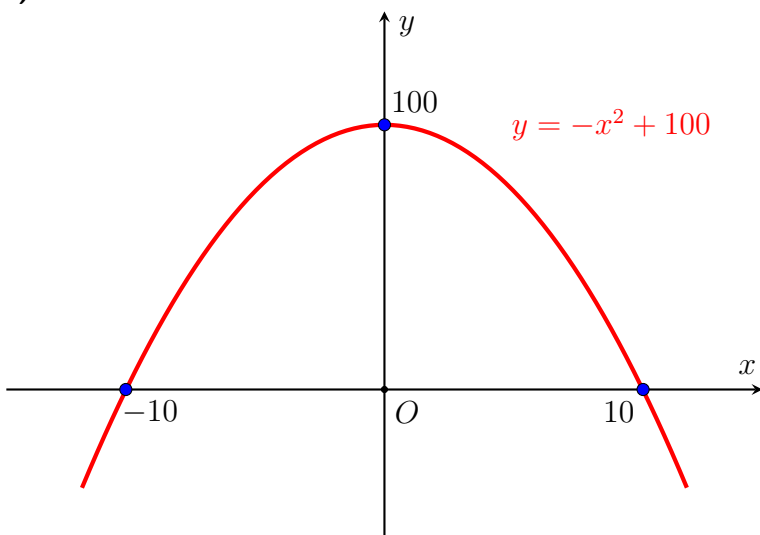
$$\begin{aligned} 1) \text{ a) } \frac{(4x^2 + 2x)^2}{(2x)^2} &= \frac{16x^4 + 16x^3 + 4x^2}{4x^2} \\ &= 4x^2 + 4x + 1 \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{(\sqrt{40} + \sqrt{4})(\sqrt{40} - \sqrt{4})}{3\sqrt{12}} &= \frac{40 - 4}{3\sqrt{12}} \\ &= \frac{36}{6\sqrt{3}} \\ &= \frac{6}{\sqrt{3}} \\ &= 2\sqrt{3} \end{aligned}$$

2) a)



b)



$$3) \text{ a) } \begin{bmatrix} 3 & 2 & -1 \\ 1 & 0 & 4 \end{bmatrix} \begin{bmatrix} 5 & 4 & 8 \\ 6 & -2 & 11 \\ 0 & -3 & 1 \end{bmatrix} = \begin{bmatrix} 27 & 11 & 45 \\ 5 & -8 & 12 \end{bmatrix}$$

b) The matrix product is undefined.

$$4) \text{ a) } |A| = 10 \cdot 12 - 25 \cdot 3 = 45$$

$$\text{b) } |B| = 1 \cdot (-12) + 2 \cdot 21 = 30$$

$$5) \begin{bmatrix} 3 & 4 & 0 \\ -2 & 3 & 2 \\ 7 & 6 & -1 \end{bmatrix}^{-1} = \frac{1}{3} \begin{bmatrix} -15 & 4 & 8 \\ 12 & -3 & -6 \\ -33 & 10 & 17 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{3} \begin{bmatrix} -15 & 4 & 8 \\ 12 & -3 & -6 \\ -33 & 10 & 17 \end{bmatrix} \begin{bmatrix} 8 \\ -1 \\ 17 \end{bmatrix} = \begin{bmatrix} 4 \\ -1 \\ 5 \end{bmatrix}$$