

## Mid-Term Exam

Allowed time: 2 hours

**Calculators are not permitted**

1. Find the elements of the conic section of equation  $y^2 - 4x^2 + 6y - 32x - 59 = 0$ , [5]  
then sketch it.
2. Find the standard equation of the parabola of focus  $F(-1, -2)$  and directrix of [4]  
equation  $y = 0$ , then sketch it.
3. Calculate the product  $AB$  of matrices [3]

$$A = \begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 2 & 3 & 4 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & -4 & 1 \\ 1 & 0 & 2 \\ -2 & 1 & 0 \end{pmatrix}.$$

4. Consider the system of linear equations

$$\begin{cases} x + y + z = 9 \\ x - y + z = 3 \\ x + y - z = 1 \end{cases}$$

- (a) Solve this system by using Cramer' rule. [4]
  - (b) Solve this system by using Gauss-Jordan elimination method. [4]
5. Evaluate the integrals
- (a)  $\int 10x^3 (x^4 + 1)^{\frac{3}{2}} dx$ . [2]
  - (b)  $\int 4x \cos(2x) dx$ . [2]
  - (c)  $\int \frac{\frac{1}{x}}{2 + \ln x} dx$ . [2]
  - (d)  $\int x \sec^2 x dx$ . [4]