

1. Find values of a , b , and c such that the polynomial $p(x) = ax^2 + bx + c$ passes through the point $(-1,0)$ and has a horizontal tangent at the point $(2,-9)$.

2. For which values of a does the following linear system

$$\begin{aligned}x_1 + x_2 + x_3 &= 4 \\x_3 &= 2 \\(a^2 - 4)x_3 &= a - 2\end{aligned}$$

a. have one solution?

b. have no solutions?

c. have infinitely many solutions?

3. Find the inverse of the following matrix $\begin{pmatrix} a & 2 & 3 \\ 0 & 1 & 4 \\ 0 & 0 & 1 \end{pmatrix}$.

4. Find a and b which make the following identity valid for all real x .

$$ax + b = \begin{vmatrix} 0 & 2 & 0 & 7 \\ 2 & 0 & 5 & 3 \\ 3 & x & 0 & 4 \\ 0 & 5 & 0 & 1 \end{vmatrix}.$$

5. Given that the determinant $\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = 7$, find $\begin{vmatrix} 2a + 2g & 6b + 6h & 2c + 2i \\ g & 3h & i \\ d & 3e & f \end{vmatrix}$.

6a. Find an equation of the plane that contains the points $(1, 0, 0)$, $(0, 1, 0)$, $(0, 0, 1)$.

6b. Find a vector equation of the line passing through the points $(1, 0, 0)$ and $(0, 1, 0)$.