Question 5   (6 marks)

Consider the following system of equations where m is a non-zero real number.
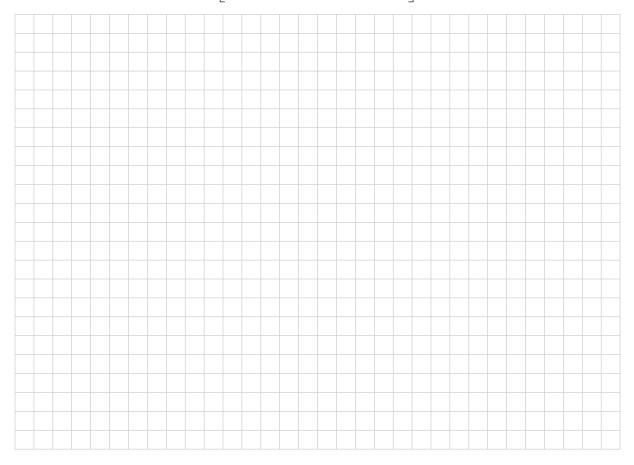
$$x + y = 0$$
$$mx + z = m^2 - 1$$
$$mx + 2my + \left(3 - m^2\right)z = 0$$

(a) Write this system of equations as an augmented matrix.

(1 mark)

(b) Using clearly stated row operations, show that the system in part (a) reduces to:

$$\begin{bmatrix} 1 & 1 & 0 & : & 0 \\ 0 & m & -1 & : & \left(1 - m^2\right) \\ 0 & 0 & \left(m^2 - 4\right) & : & \left(1 - m^2\right) \end{bmatrix}.$$

(c) (i) State a value of m for which there is a unique solution.

(1 mark)

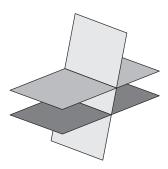(ii) Which figure below best represents the solution to this system for $m = -2$?

(1 mark)

Figure A

Figure B

Figure C

Figure D