Question 16 **(12 marks)**

Plane Π_1 has Cartesian equation $z = 2x + y + 4$.

(a) Determine a vector that is normal to plane Π_1. (2 marks)

Line L has equation $\underset{\sim}{r} = \begin{pmatrix} 2 \\ 0 \\ 3 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}$.

(b) Determine the point of intersection between line L and plane Π_1. (3 marks)

Plane Π_2 contains line L and is perpendicular to plane Π_1.

(c) Determine the vector equation for plane Π_2. (4 marks)

Sphere S has vector equation $|\underset{\sim}{r} - (3\underset{\sim}{i} + \underset{\sim}{j} + 4\underset{\sim}{k})| = \sqrt{35}$.

(d) Determine whether line L is a tangent to sphere S. Justify your answer. (3 marks)