**Name**: **Student ID**:

# Quiz

1. The equation of a straight line in the $xy$-plane is given by $2x + y = 4$.

   (a) Find the vector equation of a unit normal from the origan to the line.

   (b) Find the equation of a line passing through the point $P(0, 2)$ and perpendicular to the given line.

Linear algebra terminology will be used widely throughout this course. I would suggest you firstly read Zico Kolter's "Linear Algebra Review and Reference", which has been provided on the course website.

2. For $\mathbf{x} \in \mathbb{R}^m$ and $\mathbf{b} \in \mathbb{R}^n$, please show $\nabla_x \mathbf{b}^T \mathbf{x} = \mathbf{b}$.

3. For $\mathbf{x} \in \mathbb{R}^m$ and given a symmetric matrix $\mathbf{A} \in \mathbb{S}^m$, please show $\nabla_x \mathbf{x}^T \mathbf{A} \mathbf{x} = 2\mathbf{A}\mathbf{x}$.