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Course : **Mathematics B1**

Practice Test

1. Define $P(1, 0, -1)$ and the vectors $\mathbf{u} = \langle 3, -1, 2\rangle$ and $\mathbf{v} = \langle -1, 1, -1\rangle$.

   (a) Calculate $\mathbf{u} \times \mathbf{v}$.

   (b) Find an equation for the plane M that contains the point P and that is parallel to $\mathbf{u}$ and to $\mathbf{v}$.
   Give the equation in the form $ax + by + cz = d$.

   (c) Find the projection of $\mathbf{u}$ onto $\mathbf{v}$.

2. (a) Calculate
$$\lim_{x\to 0} \frac{x}{\sqrt{x+1}-1}.$$

   (b) For which values of p and q is the function
$$f(x) = \begin{cases} px + q & \text{if} \quad x \le 0, \\ \dfrac{x}{\sqrt{x+1}-1} & \text{if} \quad x > 0, \end{cases}$$
   continuous for every x?

3. Find the absolute extreme values of the function
$$f(x) = x\sqrt{x} - \sqrt{x}$$
   on the interval $[0, 4]$.

4. Define
$$f(x, y) = \frac{x^2 - y}{x^2 + y^2} \qquad \text{for } (x, y) \neq (0, 0).$$

   (a) Calculate
$$\lim_{(x,y)\to(0,0)} f(x, y),$$
   or show that this limit does not exist.

   (b) Find an equation for the plane tangent to the graph of $f(x, y)$ at the point $(1, 1, 0)$.