Quiz 1 **Time: 10:30AM - 11:50AM**

Instruction: Uploading of your answer sheet needs to be completed before 12:00PM in your google classroom page. Any upload after 12:00PM but before 1:00PM will result in 2 points deducted from your final score. Any upload after 1:00PM will not be counted.
Your answers to question 3, 4 and 5 needs to be properly explained. All steps leading to your conclusion should be clearly demonstrated, to obtain full score for these three questions.
You may refer to the text book or class-notes.

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1. Identify each of the following subsets of the Euclidean plane $\mathbb{R}^2$ as open set or closed set or neither: *[0.5 point each]*

   (a) $\{(x, y) : x^2 + y^2 < 2\}$.

   (b) $\{(x, y) : |x| + |y| < 1\}$.

   (c) $\{(x, y) : \max(|x|, |y|) \leq 1\}$.

   (d) $\{(0, y) : 0 < y < 1\}$.

2. Find and sketch the domains for each of the following functions: *[1 point each]*

   (a) $f(x, y) = \sqrt{(x^2 - 25)(y^2 - 16)}$.

   (b) $f(x, y) = \tan^{-1}(\frac{y}{x})$.

3. Find all the points for which the following function is continuous: *[2 points]*

$$f(x, y, z) = \frac{1}{z - \sqrt{x^2 + y^2}}$$

4. Does the following limit exist? *[2 points]*

$$\lim_{(x,y)\to(1,1)} \frac{xy^2 - 1}{y - 1}$$

5. Let

$$f(x, y) = \begin{cases} 0, & \text{if } x^2 < y < 2x^2 \\ 1, & \text{otherwise.} \end{cases}$$

   Show that $f_x(0, 0)$ and $f_y(0, 0)$ exists, but f is not differentiable at $(0, 0)$. *[2 points]*