

Department of Mathematical Sciences  
KFUPM  
Term 041

**MATH 101/ Quiz#2/ Duration=25 minutes**

Name:

ID#:

**Exercise 1** [4 Marks]

- a) Write the  $\epsilon - \delta$  definition of the limit of  $f(x) = \sqrt{x}$  at  $x = 2$ .  
b) Prove, using the  $\epsilon - \delta$  definition, that  $\lim_{x \rightarrow 2} \sqrt{x} = \sqrt{2}$ .

**Exercise 2** [6 Marks]

Let  $k$  be a given number and let  $f$  be defined by:

$$f(x) = \begin{cases} \frac{1 - \cos(kx)}{x^2} & \text{if } x > 0, \\ k^2 - 1 & \text{if } x = 0, \\ x \cos\left(\frac{1}{x}\right) + 1 & \text{if } x < 0. \end{cases}$$

- a) Write the definition of the continuity of  $f$  at  $x = 0$ .  
b) Verify that  $f$  is not continuous at  $x = 0$  for  $k = 0$ .  
c) Find all values of  $k$  that make  $f$  continuous at  $x = 0$ .