

King Saud University
Department of Mathematics

2 Mid Term Exam

280-Math

1 Semester (1439/1440)

Question1 (4). Using the $(\varepsilon - \delta)$ definition of the limit, show that $\lim_{x \rightarrow 5} (\frac{2}{5}x - 3) = -1$

Question2 (5). Decide whether the function $f(x) = x|x|$ is

(a) continuous at the point $x = 0$.

(b) differentiable at the point $x = 0$.

Question3 (5). Show that if $f(x): [-1,1] \rightarrow [-1,1]$ is a continuous function, then $\exists c \in [-1,1]$

such that $f(c) = c$.

Question4 (4). (a) is the point $c = \frac{\pi}{2}$ a critical for the function

$$f(x) = x \cos x + \frac{\pi}{2}x + (x - \frac{\pi}{2})^2 \quad ? \text{ and if so,}$$

(b) Decide whether it is a local maximum or local minimum of $f(x)$.

Question5 (4). Decide whether the function $f(x) = \sqrt{x} + \cos x$ is uniformly continuous on

$[a, \infty)$ where $0 < a \in \mathbb{R}$.

Question6 (4). Show that if $f(x)$ is differentiable on D and $f'(x) = 0$ for all $x \in D$, then

$$f(x) \equiv \text{constant} \quad (\text{on } D)$$