

King Fahd University of Petroleum and Minerals
Department of Mathematics & Statistics
Math101.03
Semester 092
Quiz (5&6)

Name:

ID #:

Serial #:

1. [2 points] Find the absolute maximum and minimum values of f on the given interval:

$$f(x) = x\sqrt{4-x^2}, \quad [-1,2]$$

2. [2 points] Let $f(x) = 1 - x^{2/3}$. Show that $f(-1) = f(1)$ but there is no number $c \in (-1,1)$ such that $f'(c) = 0$. Why does this not contradict Rolle's Theorem?

3. [2 points] Verify that f satisfies the hypotheses of the Mean Value Theorem on the given interval. Then find all numbers c that satisfy the conclusion of the Mean Value Theorem.

$$f(x) = \frac{x}{x+2}, \quad [1,4]$$

4. [2 points] For what values of a and b does the function

$$f(x) = a x e^{bx^2}$$

have the maximum value $f(2) = 1$?

5. [2 points] For the function:

$$f(x) = 2 \cos x + \cos^2 x, \quad 0 \leq x \leq 2\pi$$

- (a) Find the intervals of increase and decrease.
- (b) Find the local maximum and minimum values.
- (c) Find the intervals of concavity and the inflection points.
- (d) Sketch the graph of f .

6. [2 points] Decide if the following statements are true or not.

If they are true, then justify.

If they are **not**, then give a counter example.

(i) If $f'(x) = g'(x)$ for all x , then $f(x) = g(x)$ for all x .

(ii) If $f'(c) = 0$ and f' does not change sign at c , then f may or may not have a local maximum or minimum at c .

(iii) If f has an absolute minimum value at c , then $f'(c) = 0$.

(iv) If $f''(x)$ exists at $x = a$, then $f'(x)$ is continuous at $x = a$.

(v) If $f'(x)$ exists at $x = a$, then $f''(x)$ exists at $x = a$.

Good luck
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