

Umm Al-Qura University
Faculty of Applied Science
Department of Mathematical Science
Saturday: 23 / 3 / 1440 H



Second periodic exam
First semester 1439/1440 H
Math 4041101-4

Time Limit: $1\frac{1}{2}$ hours

Calculus(1): Differentiation and integration

Name (Print): _____

Group (Print): _____ ID (Print): _____

This exam contains 7 pages (including this cover page) and 5 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and write your name on the top of every page, in case the pages become separated.

You may *not* use your books, notes, or any **calculator** on this exam.

You are required to show your work on each problem on this exam. The following rules apply:

- **If you use a “fundamental theorem” you must indicate this** and explain why the theorem may be applied.
- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit.
- **Mysterious or unsupported answers will not receive full credit.** A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.

Problem	Points	Score
1	4	
2	4	
3	4	
4	4	
5	4	
Total:	20	

Do NOT write in the table to the right.

1. (4 points) Find $\frac{dy}{dx}$ if:

(a) (2 points) $y = 3x^5 + \sin(x)$

(b) (2 points) $y = (x^2 + 3x)^3$

2. (4 points) (a) (2 points) Find the slope of the tangent line $\left(\frac{dy}{dx}\right)$ to the curve $x^2 + y^2 = 1$ at the point $(0, 1)$.

- (b) (2 points) Use $f'(x) = \lim_{x \rightarrow c} \frac{f(x) - f(c)}{x - c}$ to find $f'(2)$, given that $f(x) = x^2$.

3. (4 points) Find $\frac{d^2y}{dx^2}$ for each of the following

(a) (2 points) $y = x^2 \tan(x)$

(b) (2 points) $y = \frac{x}{x^2+1}$

4. (4 points)

(a) (2 points) Find $f^{(5)}(x)$ and $f^{(6)}(x)$ if $f(x) = x^5 - 15x^3 - 1005x + 4$.

(b) (2 points) An object is moving along a horizontal coordinate line according to the formula $s(t) = t^3 - 9t^2 + 24t$, where s is measured in feet and t is measured in seconds. Find the velocity $v(t)$ and the acceleration $a(t)$ at any time t .

5. (4 points) Given that $f(x) = x^3 - 6x^2 + 4$,
- (a) (2 points) identify the critical points and find the extreme values for $f(x)$ on $[-2, 5]$
- (b) (2 points) determine where the graph of $f(x)$ is increasing, decreasing, concave up, and concave down.

Best regards.