Prince Sultan University

Deanship of Educational Services

Department of Mathematics
and General Sciences

COURSE DETAILS:

Calculus I	MATH 111	MAJOR EXAM II
Semester:	Spring Semester --Term 172	
Date:	Sunday April 15, 2018	
Time Allowed:	90 minutes	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	
Instructor's Name:	

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

GRADING:

	Page 1	Page 2	Page 3	Page 4	Total	Total
Questions						
Marks	**16**	**16**	**18**	**10**	**60**	**20**

Q1. [5 pts] Find the equation of the normal line to the curve $y = \frac{3}{x} - \frac{2}{\sqrt[3]{x}} + 2\sqrt{x}$ at $x = 1$.

Q2. [5 pts] If $\tan(x + y) + \csc xy = x - 9$, find $\frac{dy}{dx}$. **(Show your work in details)**

Q3. [4 pts] Prove the identity $\coth^2 x - 1 = \operatorname{csch}^2 x$.

Q4. [20 pts] Find the derivative of each of the following functions **(Show your work in details)**

a. $y = \arctan(\sqrt{3x})$

b. $y = (2 - 3\log_2 x)(e^{2x} - \cos x)$

c. $y = (\arcsin(\sqrt{x}))^6$

d. $y = \left(\frac{9x+5}{3x^2-7x}\right)^{10}$

e. $y = (\ln x)^{\cosh x}$

Q5. [5 pts] Find the absolute maximum and absolute minimum values of

$f(x) = -2x + \sin^{-1} x$ on $[-1,1]$.

Q6. [4 pts] Show that the equation $x^3 + e^x = 0$ has exactly one root.

Q7. [6 pts] Verify that the function $f(x) = x^3 - 3x + 2$ satisfies the hypotheses of the **Mean Value Theorem** on the interval $[-2,2]$. Then find all numbers c that satisfy the conclusion of the Mean Value Theorem.

Q8. [5 pts] Two cars start moving from the same point. One travels north at 460 km/h and the other travels east at 90 km/h. At what rate is the distance between the cars increasing 3 hours later?

Q9. [6 pts] Find the critical numbers of the function $f(x) = x^{3/4} - 2x^{1/4}$.