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 182	
Date:	Sunday March 24, 2019	
Time Allowed:	90 minutes	

STUDENT DETAILS:

Student Name:			
Student ID Number:			
Section Number:		Attendance Serial Number:	
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	**15**	**15**	**15**	**15**	**60**	**20**

Q1. [3 pts] Find the equation of the tangent line to the curve $f(x) = \frac{xe^x + 2x^2 \ln x}{x^2}$ at $x = 1$.

Q2. [3 pts] Given that $f(3) = 8$ and $f'(3) = -24$, Evaluate $\frac{d}{dx}\left[\sqrt[3]{f(x)}\right]$ at $x = 3$.

Q3. [3 pts] Evaluate: $\lim_{x \to 0} \frac{\sin^2(7x)}{x^3 + 2x^2}$

Q4. [1 pts] Find $\lim_{x \to -\infty} \sinh(7x)$

Q5. [5 pts] Find the slope of the tangent line to the graph of $2^{x+y} = x^2 + xy^2 + 1$ at $(-1,1)$

Q6. [15 pts] Find the derivative of each of the following functions: **(Note: Do not simplify the derivative)**

a. $y = \sqrt[5]{x}\,\ln\left(1+2\sqrt{x}+3\sqrt[3]{x}+4\sqrt[4]{x}\right)$

b. $y = \dfrac{2^x \coth x}{1+\cot^{-1} x}$

c. $y = 7^{\sin^{-1}(2x)}$

d. $y = \ln(2e^{-x}+3xe^{5x})$

e. $y = (x^2+3x+1)^{\tan x}$

Q7. [5 pts] Find the parabola with equation $y = ax^2 + bx$ whose tangent line at $x = 1$ has equation $y = -2x + 1$.

Q8. [5 pts] If $x^2 + 4y^2 = 7$, show that $y'' = \frac{-7}{16y^3}$.

Q9. [5 pts] If $x^2 + xy + 4y^3 = 1$, find $y'''(1)$.

Q10. [6 pts] A water tank has the shape of an inverted circular cone with base diameter 8 m and height 8 m. If water is being pumped into the tank at a rate of 2 m^3/min, find the rate at which the water level is rising when the water is 3 m deep.

Q11. [4 pts] For what values of x does the graph of $f(x) = -2x + 2\sinh x$ has a horizontal tangent?

Q12. [5 pts] Let $f(x) = \ln\left[\dfrac{\sin^2 x \cdot \tan^4 x}{(1+\cos^2 x)^3}\right]$, find $f'(\dfrac{\pi}{4})$.