

PRINCE SULTAN UNIVERSITY

MATH 111

Calculus

MAJOR EXAM II

Start: 4:00 pm

End: 5:30 pm

Name _____

I.D. _____

Section: (8 AM)

(9 A.M)

(10 AM)

(12 PM)

1. Answer all questions
2. This exam consists of 4 pages, 9 questions
3. You can use a calculator, NOT a mobile phone.
4. No talking during the test.
5. Show all working out in the space provided.

Question No.	Max. Points	Points Scored
1,2,3	18	
4,5,6	20	
7,8	12	
TOTAL	50	

Q1. (9 points) Find the limits

a. $\lim_{x \rightarrow 0} \frac{\sin(5x)}{2x^2 - 7x}$

b. $\lim_{x \rightarrow \infty} \frac{(2x^2 + 1)^2}{(x + 2)^2(x^2 - 2x)}$

c. $\lim_{x \rightarrow \infty} \frac{2e^x - 3e^{-x}}{e^x + 2e^{-x}}$

Q2. (4 points) Use the definition to find the derivative of the function $f(x) = \sqrt{x} - 3$

Q3. (5 points) If $xy + e^y = e$, find the value of y'' at the point where $x = 0$.

Q4. (12 points) Find the derivative of the functions (Simplify your answers if possible)

a. $y = \sec^2(2x)$

b. $y = e^{x \sin(2x)}$

c. $y = \sqrt{1 + 2e^{2x}}$

d. $y = x \sin^{-1}(x) + \sqrt{1 - x^2}$

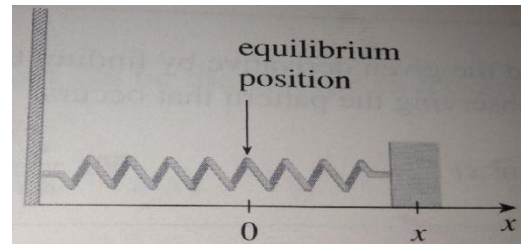
Q5. (5 points) Find equations of the tangent line and the normal line to the curve $x^2 + xy + y^2 = 4$ at the point where $x = 0$.

Q6. (3 points) If $g(x) + x \sin(g(x)) = x^2$ and $g(0) = \frac{\pi}{2}$, find $g'(0)$.

Q7. (3 points) If $y = (1 + x)e^{2x}$, show that $y'' - 4y' + 4y = 0$

Q8. (5 points) A mass on a spring vibrates horizontally on a smooth level surface. The equation of motion is $x(t) = 8 \sin(t)$, where t is in seconds and x is in centimeters at time t .

a. Find the velocity and acceleration at time t .



b. Find the position velocity, and acceleration of mass at time $t = 2$ seconds.

Q9. (4 points) Find the vertical and horizontal asymptotes (if any) of the curve

$$y = \frac{2e^x}{e^x - 5}$$