



PRINCE SULTAN UNIVERSITY

MATH 111

CALCULUS 1

MAJOR EXAM 2

22nd DEC. 2010

Start: 4:00 p.m.

End: 5:30 p.m.

Name: _____

I.D.: _____ **Instructor:** _____

1. Answer all questions
2. This exam consists of 1 Cover Sheet & 4 Question Sheets with 18 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
1,2,3,4,5,6	28	
7,8,9,10,11	26	
12,13,14,15	22	
16,17,18	24	
TOTAL	100	

- 1) [4 points] Given that $f(-2) = 3$ and $f'(-2) = -4$, find an equation for the tangent line to the graph of $y = f(x)$ at $x = -2$.
- 2) [4 points] Find $\frac{dx}{dt}$, given that $x = \frac{t^2 + 1}{3t}$.
- 3) [6 points] Show that if $x \neq 0$ then $y = \frac{1}{x}$ satisfies the equation $x^3 y'' + x^2 y' - xy = 0$.
- 4) [6 points] Given that $y = \frac{x^2 + 1}{x - 1}$, find all the values of x at which the tangent line to this curve is horizontal.
- 5) [4 points] Given that $f(3) = 10$, $f'(3) = -1$, $g(3) = -3$ and $g'(3) = 2$, find $F'(3)$ where $F(x) = 2f(x)g(x)$.
- 6) [4 points] Given that $f(x) = \sec x \tan x$, find $f'(x)$.

7) [6 points] Given that $y = x \cos x$, find $\left. \frac{d^2 y}{dx^2} \right|_{x=\frac{\pi}{4}}$.

8) [4 points] Find $\frac{dy}{dx}$, given that $y = 2 \cos^3(3x^5)$.

9) [6 points] Find an equation for the tangent line to the graph of $y = x^2 \sqrt{5-x^2}$ at $x=1$.

10) [6 points] Given that $y = \left(\frac{x-5}{2x+1} \right)^3$, show that $\frac{dy}{dx} = \frac{33(x-5)^2}{(2x+1)^4}$.

11) [4 points] Given that $y = \left[1 + \sin^3(x^5) \right]^{12}$, find $\frac{dy}{dx}$.

12) [6 points] Find $\frac{d^2y}{dx^2}$, given that $x^3y^3 - 4 = 0$.

13) [6 points] Find the slope of the tangent line to the curve $y^3 + yx^2 + x^2 - 3y^2 = 0$ at the point $(0, 3)$.

14) [6 points] Find $\frac{dy}{dx}$ for the following functions:

a) $y = \log_2(x^3 + 3x^2)$

b) $y = x^3 \ln x$

15) [4 points] Given $y = \log(\sin^2 x)$, show that $\frac{dy}{dx} = \frac{2 \cot x}{\ln 10}$.

16) [6 points] Find $\frac{dy}{dx}$, given that $y = \frac{(x^2 - 8)^3 \sqrt{x^3 + 1}}{x^6 - 7x}$.

17) [12 points] Find $\frac{dy}{dx}$ for the following functions:

a) $y = e^{-2x^2}$

b) $y = \pi^{x \tan x}$

c) $y = \tan^{-1}(3x^3)$

d) $y = x^2 [\sin^{-1} x]^3$

18) [6 points] A stone dropped into a still pond sends out a circular ripple whose radius increases at a constant rate of 2 ft/s. How rapidly is the area enclosed by the ripple increasing at the end of 5 seconds?