PRINCE SULTAN UNIVERSITY

MATH 111 CALCULUS I

MAJOR EXAM 1 11th NOVEMBER 2009

Start: **6:00 p.m.**
End: **7:30 p.m.**

Name: _____

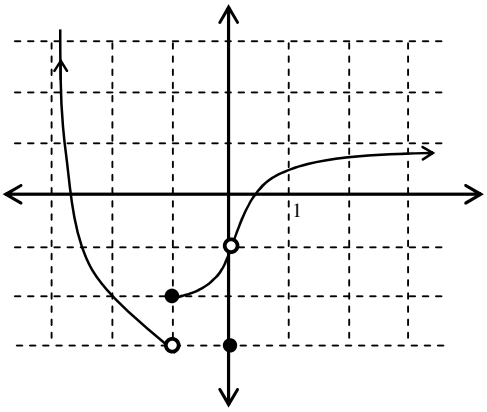
I.D. _____

Instructors Name: _____ **Section:** _____

1. Answer all questions
2. This exam consists of 1 Cover Sheet & 4 Question Sheets with 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	24	
3,4,5	24	
6,7	28	
8,9	24	
TOTAL SCORE	100	

1) [16 points] Use the graph of $y = f(x)$ to find the following:



a) $f(0) =$

b) $\lim_{x \to 0} f(x) =$

c) Is $f(x)$ continuous at $x = 0$? Explain why?

d) $\lim_{x \to -1^-} f(x) =$

e) $\lim_{x \to -1} f(x) =$

f) $\lim_{x \to -2} f(x) =$

g) $\lim_{x \to +\infty} f(x) =$

h) $\lim_{x \to -3^+} f(x) =$

2) [8 points] Find the domain of each function:

a) $f(x) = \dfrac{1}{x^2 - 2x - 8}$

b) $g(x) = \sqrt{2x + 7}$

3) [8 points] consider the functions $f(x) = x^2 + 1$, $g(x) = \sqrt{x^2 - 1}$. Find in simplest form:

a) $(g \circ f)(1)$

b) $(f \circ g)(x)$

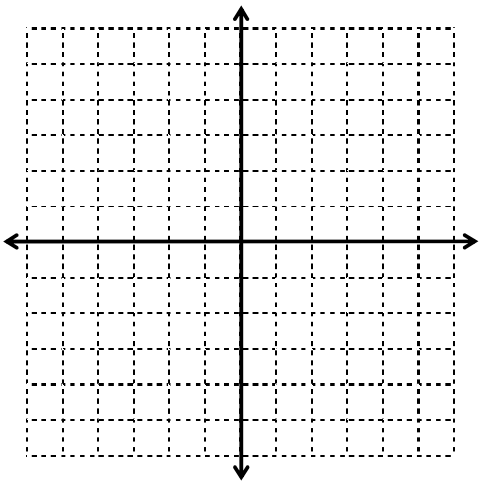
c) $\dfrac{f(x) - 2x}{g^2(x)}$

d) Is the function f odd, even , or neither? Explain.

4) [8 points] a) State the geometric property common to all lines in the family: $ky - 3x + 6 = 0$

b) Find an equation for the family of lines parallel to $4x + 2y = 3$

5) [8 points] Sketch the graph of $f(x) = \dfrac{1}{(x-1)^2} - 4$. **Show clearly the location of the *x* and *y* intercepts.**



6) [16 points] Find the value of the following limits:

a) $\lim_{x\to 1} \dfrac{2x-1}{x^2+2x+2}$

b) $\lim_{x\to 2} \dfrac{\sqrt{x+2}-2}{x-2}$

c) $\lim_{x\to -1^+} \dfrac{x+3}{x+1}$

d) $\lim_{x\to -2} \dfrac{x^2+x-2}{x^2-4}$

7) [12 points] Find the value of the following limits:

a) $\lim_{x\to -\infty} \dfrac{2x^6-3x^4+5x^3+x+7}{3-x^3}$

b) $\lim_{x\to +\infty} \dfrac{5x^3-2x^4+x-3}{3x^4+x^3+5}$

c) $\lim_{x\to -\infty} \dfrac{\sqrt{4x^2-9}}{x+1}$

8) [12 points] Find the value of the following limits:

a) $\lim_{x\to+\infty} \cos\left(\frac{2x}{x^2+1}\right)$

b) $\lim_{x\to 0} \frac{\sin 2x}{\sin 5x}$

c) $\lim_{x\to 0} \frac{\sin x \tan 2x}{x^2}$

9) [12 points] a) Find the values of x at which the function $f(x) = \frac{x}{|x|-3}$ is not continuous.

b) Study the continuity of the function $f(x) = \begin{cases} \frac{x^2-4}{x-2} & , \quad x \neq 2 \\ 4 & , \quad x = 2 \end{cases}$ at $x = 2$.

c) Find the value of the constant k such that the function $f(x) = \begin{cases} 3x+1 & , \quad x \leq 3 \\ kx-2 & , \quad x > 3 \end{cases}$ is continuous everywhere.