

Prince Sultan University
Department of Mathematical Sciences
Major I Exam

Semester II, 2015 SPRING (142)

11th March, 2015

MATH 111 – CALCULUS I

Time Allowed : 90 minutes

Maximum Points: 80 points

Name of the student: _____

ID number : _____

Dr. Kamal Abodayeh	Dr. Nabil Mlaiki	Mr. Khaled Naseralla
Section 223	Section 225	Section 224
8 ----- 9	11 ----- 12	10 ----- 11

Important Instructions

- You may use a **SCIENTIFIC CALCULATOR** that does **NOT** have **GRAPHING** capabilities.
- You may **NOT** borrow a calculator from anyone.
- Answer **ALL** the questions.
- Show all the key steps of your work in the space provided for each question. Please indicate your **FINAL** answers clearly.
- You may use the **BACK** of the pages for extra space, but be sure to indicate that on the page with the problem.
- There should be **NO** talking during the exam.
- This exam has **11** problems, some with several parts. Make sure your paper has all these problems.

Question	Maximum Points	Points Earned
1 , 2	14	
3 , 4	14	
5 , 6 , 7	16	
8	20	
9 , 10 , 11	16	
Total	80	

Q.1 (6 points): Find the Domain of each function.

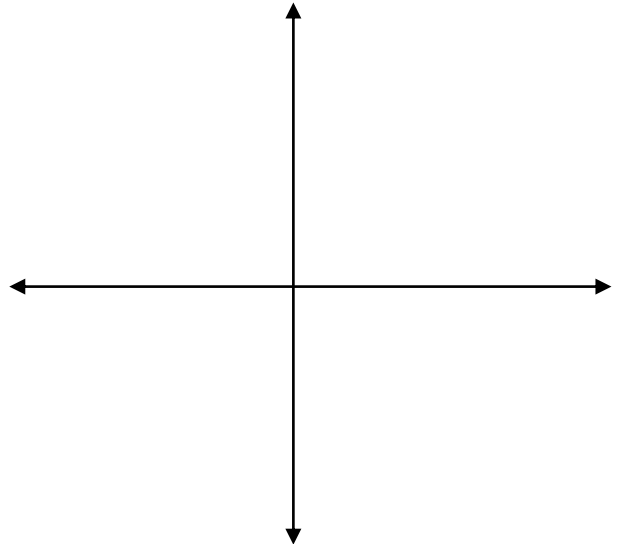
a) $f(x) = \frac{1}{\sqrt{x+2}-3}$

b) $f(x) = \sqrt{2-5^x}$

Q.2 (8 points): Let $f(x) = -1 + 2\ln(-x + 3)$

a) Use transformations to sketch the graph of f .

Show the location of the **asymptote** and the **x or y intercepts, if any**. (Without using a table of values)



b) State the domain and range of f .

c) Find the inverse function of f .

Q.3 (4 points): If $f(x) = \ln(x+5)$ and $g(x) = x^2 - 9$, find:

a) $f \circ g$

b) Domain of $f \circ g$

Q.4 (10 points):

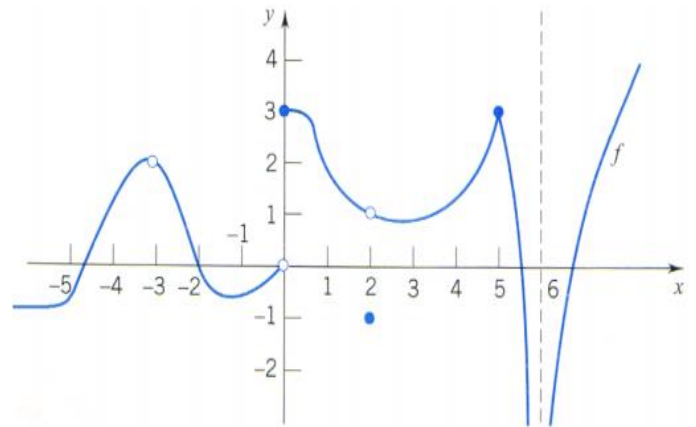
Use the graph of $f(x)$ shown to answer the questions

a) $\lim_{x \rightarrow -\infty} f(x)$

b) $\lim_{x \rightarrow +\infty} f(x)$

c) $\lim_{x \rightarrow 6^+} f(x)$

d) $\lim_{x \rightarrow 0} f(x)$



e) $f(2)$

f) Is f continuous at $x=2$? Why or why not?

g) At what number(s) is(are) f **not differentiable**.
Give reasons.

Q.5 (4 points): Show that $\lim_{x \rightarrow 0} x^2 \cos\left(\frac{1}{x}\right) = 0$

Q.6 (6 points): Use the definition to find the derivative of the function: $f(x) = \frac{4}{x+5}$.

Q.7 (6 points): Find the equation of the tangent line to the curve of $y = x^2 - x$ at $x = 2$

Q.8 (20 points): Evaluate the limit, if it exists.

a) $\lim_{x \rightarrow 5} \frac{x^2 - 25}{x^2 - 4x - 5}$

b) $\lim_{y \rightarrow -\infty} \frac{2 - x}{\sqrt{9 + 6x^2}}$

c) $\lim_{x \rightarrow -3^-} \frac{2x}{x + 3}$

d) $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \frac{1}{x^2 + x} \right)$

e) $\lim_{x \rightarrow 0} \left(\frac{\sqrt{x+1} - \sqrt{1-x}}{x} \right)$

Q.9 (4 points): Show that there is a root of the equation: $\sqrt[3]{x} = 1 - x$ in the interval $(0,1)$.

Q.10 (6 points): Study the continuity of the function.

$$f(x) = \begin{cases} \sin(x) & \text{if } x < 0 \\ 1 & \text{if } x = 0 \\ x - x^2 & \text{if } x > 0 \end{cases}$$

Q.11 (6 points): Find the vertical and the horizontal asymptotes, if any of the function. **Show your work**

$$y = \frac{1 - e^x}{1 - 2e^x}$$