Prince Sultan University

MATH 111

Major Exam I

Semester I, Term 161

Monday, November 07, 2016

Time Allowed: **90** minutes

Student Name: _____

Student ID #: _____

Teacher's Name: _____Section #: _____

Serial #: _____

Important Instructions:

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is seen or heard
6. Looking around or making an attempt to cheat will result in your exam being cancelled
7. This examination has 11 problems, some with several parts. Make sure your paper has all these problems.

Page #	Max points	Student's Points
1,2,3,4	23	
5	20	
6,7,8	22	
9,10,11	15	
Total	**80**	

Q1. (5 points) Find the domain of the function $f(x)=\dfrac{\ln(|x|-1)}{x^3-8}$. **(Show your work in details)**

Q2. (5 points) Find the formula for the inverse of the function $f(x)=\dfrac{e^x}{1+2e^x}$. **(Show your work in details)**

Q3. (3 points) Use the Intermediate Value Theorem to show that the equation $\sqrt[3]{x}=1-x$ has a root in the interval (0, 1). **(Show your work in details)**

Q4. (10 points) Find the horizontal and vertical asymptotes of each curve: **(Show your work in details)**

1. $y=\dfrac{7e^x}{2e^x-5}$

2. $y=\dfrac{9+5x^4}{x^2-x^4}$

Q5. (20 points) Evaluate the limit, if it exists. **(Show your work in details)**

a. $\lim_{x \to -2} \frac{x+2}{x^3+8}$

b. $\lim_{x \to -4} \frac{\left(\frac{1}{4}+\frac{1}{x}\right)}{4+x}$

c. $\lim_{x \to 1} \left(\frac{1}{x-1} - \frac{1}{|x-1|} \right)$

d. $\lim_{x \to \infty} \frac{Sin^2 x}{x^2+8}$

Q6. (10 points) a. Use the **definition** to find the derivative of the function $f(x)=\sqrt{x+3}$.

b. Find the equation of the tangent line at $x=1$. **(Show your work in details)**

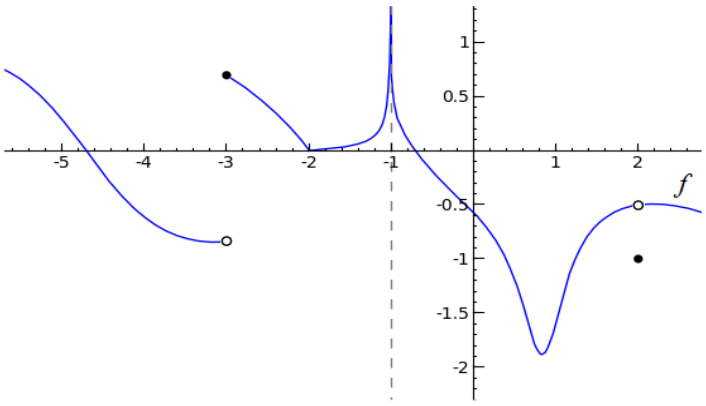
Q7. (4 points) For what value of *x*, *f(x)* is continuous $f(x)=\begin{cases}\dfrac{2x^2-5x-3}{x-3} & x\neq 3\\ 6 & x=3\end{cases}$. **(Show your work in details)**

Q8. (8 points) Use the graph of the function to find the following:

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

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

c) State the numbers at which f discontinuous and explain why?



d) For each of these numbers in part c), **determine with writing the reason** whether $f(x)$ is continuous from the right, from the left, or neither.

Q9. (4 points) If $4x-9 \le f(x) \le x^2-4x+7$ for $x \ge 0$, find $\lim_{x\to 4} f(x)$. **(Show your work in details)**

Q10. (5 points) Find all values of "***a***", such that the function

$$f(x)=\begin{cases} x+1 & \text{if} \quad x \le a \\ x^2 & \text{if} \quad x > a \end{cases}$$ is continuous for all real numbers.

Q11. (6 points) Sketch the graph of an example of a function f that satisfies all the given conditions.

$\lim_{x\to\infty} f(x)=2$, $\lim_{x\to -\infty} f(x)=4$, $\lim_{x\to 2^+} f(x)=\infty$, $\lim_{x\to 2^-} f(x)=-\infty$, $\lim_{x\to 0} f(x)=2$, and $f(0)=1$