



Prince Sultan University

MATH 111

Major Test I

Semester I, Term 151

Monday, October 19, 2015

Time Allowed: **90 minutes**

Student Name: _____

Student ID #: _____

Teacher's Name: _____ Section #: _____

Serial #: _____

Important Instructions:

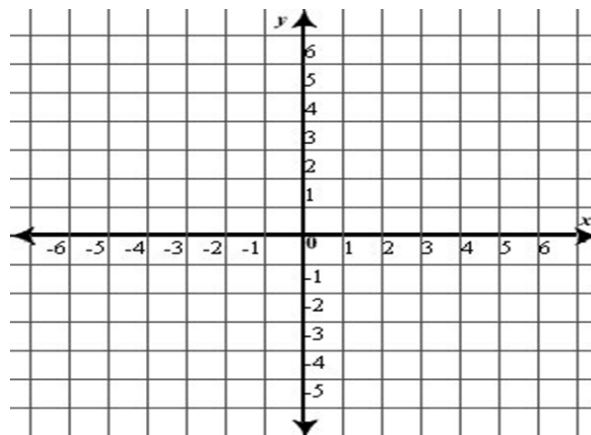
1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is 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.

Problems	Max points	Student's Points
1,2,3,4	19	
5	25	
6,7,8	20	
9,10,11	16	
Total	80	

Q1. (2 points) Find the domain of the function $F(x) = \sqrt[3]{5 - |x|}$

Q2. (4 points) Graph the function by starting with standard function and using transformation:

$$y = |\sqrt[3]{x} - 1|$$



Q3. (5 points) Show that the equation $\sin x = x^2 - x$ has a root in the interval $(1, 2)$.

Q4. (8 points) Find the horizontal and vertical asymptotes of each curve: **(Show your work in details)**

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

2. $y = \frac{1 + x^4}{x^2 - x^4}$

Q5. (25 points) Evaluate the limit, if it exists. **(Show your work in details)**

1. $\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{|x - 3|}$

2. $\lim_{x \rightarrow \infty} \frac{2 - 3x^3}{6x^3 + 5000x + 100}$

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

4. $\lim_{x \rightarrow \infty} \frac{\cos x}{x^2 + 1}$

5. $\lim_{x \rightarrow 1} \frac{x^2 - 1}{\sqrt{x+3} - 2}$

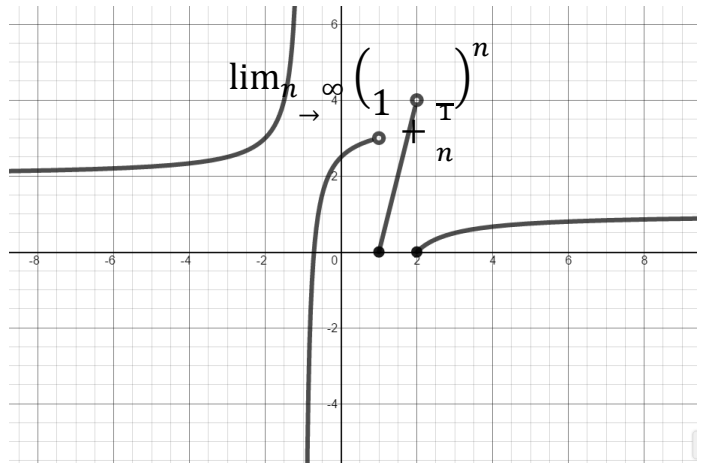
Q6. (4 points) Use the graph of the function to find the following:

a) $\lim_{x \rightarrow 2} f(x)$

b) $\lim_{x \rightarrow -1^-} f(x)$

c) $\lim_{x \rightarrow \infty} f(x)$

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



Q7. (8 points) a. Use the definition to find the derivative of the function $y = 3x - x^2$.

b. Find the equation of the tangent line at $x = 4$.

Q8. (8 points) Find the value of “a” and “b” that makes the function continuous everywhere.

$$f(x) = \begin{cases} \frac{x^2 - 1}{x + 1} & x < 1 \\ ax^2 - bx - 1 & 1 \leq x < 2 \\ x - 2a + b & x \geq 2 \end{cases}$$

Q9. (6 points) a. Prove that if a function $f(x)$ is differentiable at $x = a$, then it is continuous at $x = a$.

b. Give a counter example where the converse is not true (Justify your answer)

Q10. (5 points) Find $\lim_{x \rightarrow -\infty} \sqrt{x^2 - 2} + x$

Q11. (5 points) Find $\lim_{x \rightarrow \infty} f(x)$, if for all $x > 1$, $\frac{10e^x - 21}{2e^x} \leq f(x) \leq \frac{5\sqrt{x}}{\sqrt{x-1}}$.