KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS & STATISTICS
Term 181
MATH 101 Chapter 4 Test

Name: _____ ID #: _____

1. Consider the function $f(x) = x^4 - 2x^2 + 3.$
   a. Find the intervals on which f is increasing or decreasing. *(2 marks)*

   b. Find the local maxima and minima of *f*. *(2 marks)*

   c. Find the intervals of concavity and the inflection points. *(2 marks)*

2. Find $\lim_{x\to 1}\left(\frac{x}{x-1}-\frac{1}{\ln x}\right)$ *(3 marks)*

3. Let $f(x)=(x-3)^{-2}$.

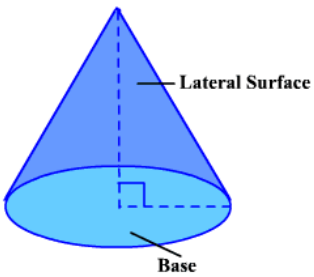
   a. State the Mean Value Theorem. *(2 marks)*

   b. Show that there is no values of *c* in $(1,4)$ such that $f(4)-f(1)=f'(c)(4-1)$. *(2 marks)*

   c. Why does this not contradict the Mean Value Theorem. *(1 mark)*

4. For what values of a and b is (2, 2.5) an inflection point of the curve $x^2y + ax + by = 0$?
(5 marks)

5. A cone-shaped paper drinking cup is to be made to hold 27 cm^3 of water. Find the height and radius of the cup that will use the smallest amount of paper. *(5 marks)*



The lateral surface area of the cone is πrl, where l is the slant heigth of the cone.

6. Find the root of the equation $x^3 - x = 1$, starting with $x_1 = 1$, and ending with x_3. *(3 marks)*

7. If $f'(t) = t + \frac{1}{t^3}, t > 0.$ Find $f(t)$, knowing that $f(1) = 6$. *(3 marks)*

8. A car is travelling at 16 m/sec when the brakes are fully applied, producing a constant deceleration of 7 m/sec^2. What is the distance traveled before the car comes to a stop? *(5 marks)*