Kuwait University | Math 101 | Date: July 22, 2004

Dept. of Math. & Comp. Sci. | Second Exam | Duration: 75 minutes

Calculators, mobile phones, pagers and all other mobile communication equipment are not allowed

1. Use differentials to approximate $\sqrt{1.1}+\sqrt[3]{1.1}$. (3 pts.)

2. If $y=\dfrac{(u-1)^2}{u^2+1}$ and $u=\sec^2 x+1$, then find $\dfrac{dy}{dx}$ at $x=\dfrac{\pi}{4}$. (4 pts.)

3. Find an equation for the tangent line to the graph of
$$y^2=x^3y^2-x\sin y \quad \text{at the point } P(1,\pi).$$ (4 pts.)

4. (a) State Rolle's Theorem. (1 pt.)

   (b) Show that
   $$f(x)=x^4+2x^2-3x+1$$
   has exactly one critical number. (4 pts.)

5. A cone of ice cream whose altitude is three times its base radius, is melting, without loosing shape, at a rate of 0.3 cm^3/min. Find the rate at which its altitude is changing when its radius is 2 cm.. (4 pts.)

6. Let $f(x)=x^3-6x^2+9x-4$.

   (a) Find the intervals on which f is increasing and the intervals on which f is decreasing. Find the local extrema of f, if any. (1.5 pt.)

   (b) Find the intervals on which the graph of f is concave upward and the intervals on which the graph of f is concave downward. Find the points of inflection, if any. (1.5 pt.)

   (c) Sketch the graph of f. (2 pts.)