Kuwait University | Math 101 (Calculus I) | March 29, 2006
Dept of Math & Comp Sci | First Examination | Duration: 90 mins

The use of any type of calculator is not allowed. Turn off your mobile phone or pager

1. Evaluate the limit, if it exists, or explain why the limit does not exist. **(3 points)**

$$\lim_{x\to 0} (\sin x)\sqrt{1+\frac{1}{x^2}}$$

2. Find and classify the points of discontinuity, if any, for the function $f(x)=\dfrac{(2x+3)(x^2-4)}{2x^2+3x-2}$.

(4 points)

3. Find constants A and B so that the function $f(x)$ given below is continuous everywhere.

(4 points)

$$f(x)=\begin{cases} Ax^2+B & , x<-1 \\ -x+2B & , -1\le x\le 0 \\ A\frac{\sin 2x}{x}+B & , x>0 \end{cases}$$

4. Find the x-coordinates of the points on the graph of $f(x)=\dfrac{x+1}{2x^2-x+1}$ at which the tangent line is horizontal.

(3 points)

5. (a) State the Intermediate Value Theorem. **(1 point)**

   (b) Given $f(x)=x^2+x\cos^2 x-1$. Use the intermediate value theorem to show that there is a real number c between $-\frac{\pi}{2}$ and 0 such that $f'(c)=0$. **(3 points)**

6. Find $\dfrac{dy}{dx}$ if $y=(u^2+u+1)^2$ and $u=\sqrt[3]{x\sec x+1}$. **(3 points)**

7. Given $f(x)=\begin{cases} x^2-x+1 & , x<1 \\ x^3 & , 1\le x. \end{cases}$

   Find $f'(-1)$ and $f'(1)$ if they exist or explain why, if any of them does not exist. **(4 points)**