Kuwait University | Math 101 | Date: July 3, 2004
Dept. of Math. & Comp. Sci. | First Exam | Duration: 75 minutes

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

1. (a) Use the definition of the limit to show that

$$\lim_{x\to 2}(3x-5)=1. \qquad \text{(3 points)}$$

(b) Find $\dfrac{dy}{dx}$ where $y=\dfrac{x\sin x}{1+\cot x}$. (3 points)

2. Find the vertical and horizontal asymptotes, if any, for the graph of

$$f(x)=\frac{|x+1|}{x^2+x} \qquad \text{(5 points)}$$

3. Let

$$f(x)=\begin{cases}\dfrac{x^2-x^4}{\tan(1-x^2)} & \text{, if } x>1\\ 1 & \text{, if } x=1\\ \dfrac{\sqrt{x}-1}{x^2-5x+4} & \text{, if } x<1\end{cases}.$$

Classify the discontinuity of f at $x=1$ (5 points)

4. (a) State the Intermediate Value Theorem. (1 point)

(b) Show that there is a number c such that the tangent line to the graph of $f(x)=x^5+x^3+3x^2-2x-1$ at $P(c,f(c))$ is parallel to the line $y=x$. (4 points)

5. Show that the graph of $f(x)=2-\frac{3}{2}x^{\frac{2}{3}}$ has a cusp. (4 points)