Kuwait University	Math. 101	October 28, 1993
Mathematics Dept.	First Examination	Duration: 75 minutes

Answer all of the following questions. Each question is worth 10 points.

Calculators are not allowed.

1. (a) Solve the inequality : $\dfrac{4}{x^3-x} < \dfrac{3-x}{x^2-1}$.

   (b) Let f and g be two functions given by $f(x) = x^2+4$, and $g(x) = \sqrt{3-2x}$. Find the domain of $f \circ g$ and compute $(f \circ g)(x)$ for x in the domain of $f \circ g$.

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

$$\lim_{x \to -\frac{1}{2}} (-2x+1) = \frac{5}{3}.$$

   (b) Use the sandwich theorem to evaluate $\lim\limits_{x \to 1} (x-1)^2 \sin \dfrac{1}{x-1}$.

3. (a) Find the point, P, of intersection of the two lines:

$$L_1 : \ 2x+5y = 11 \quad \text{and} \quad L_2 : \ 3x-y+9 = 0,$$

   then find the equation of the circle having the points P and $Q(-2,1)$ as endpoints of a diameter.

   (b) Prove the trigonometric identity : $2\cot 2\theta = \cot\theta - \tan\theta$.

4. (a) Find all the solutions in $[0, 2\pi)$ of the equation :

$$(1-2\cos\theta)(3+2\sin 3\theta) = 0.$$

   (b) Find the following limit if it exists

$$\lim_{x \to 1} \frac{3\,|\,x-1\,|}{x-x^3}.$$

Good Luck