American University of Beirut

MATH 201

Calculus and Analytic Geometry III

Fall 2005-2006

quiz # 1

Name: ..... ID #: .....

1. *(12 points, 6 points each)* Find each of the following limits:

a) $\lim_{n\to+\infty} \dfrac{n^{2/n}\sin^2 n}{\sqrt{n}+10}$

b) $\lim_{n\to+\infty} \dfrac{(n+1)^{n+1}}{(2n+1)n^n}$

2. *(40 points, 8 points each)* Determine if the following **series** converges or diverges. **Justify your answers**

a) $\sum_{n=0}^{+\infty} \dfrac{1}{e^{2n}+n}$

b) $\sum_{n=0}^{+\infty} n^{2n}e^{-n}$

c) $\sum_{n=1}^{+\infty} \dfrac{\ln^3 n}{n\sqrt{n}}$

d) $\sum_{n=1}^{+\infty} \dfrac{(-1)^n \cos n}{2^n}$

e) $\sum_{n=1}^{+\infty} \dfrac{1}{n^{\ln n/n}}$

3. *(14 points)* Find $\sum_{k=1}^{\infty} \left[\dfrac{k!-6^k}{3^k.(k-1)!}\right]$

4. **a)** *(15 points)* Find the interval of convergence of the power series $\sum_{n=2}^{+\infty} \dfrac{(2x-1)^n}{4^n \ln n}$

(*be sure to check convergence at the endpoints*)

b) *(3 points)* For what value(s) of x for which the series converges (i) absolutely? (ii) conditionally?

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

a) *(5 points)* Find the Maclaurin series expansion of f.

b) *(5 points)* How accurate is the approximation $f(x) = x - x^3$ on the interval $[0; 0.1]$?

c) *(6 points)* Find $f^{(n)}(0)$.

(hint: you may notice that f is odd !)