

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) $\lim_{n \rightarrow +\infty} \frac{n^{2/n} \sin^2 n}{\sqrt{n} + 10}$

b) $\lim_{n \rightarrow +\infty} \frac{(n+1)^{n+1}}{(2n+1)n^n}$

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

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

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

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

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

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

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

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

(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 !)