Calculus II Name:________________________

Your Code:__________ Student ID:______________________

Quiz 1

Feb. 23, 2006

1. (5pts) Determine if the sequence converges or diverges. If it converges, determine the limit.

$$a_n = \frac{2n^2+1}{n^2-3}$$

Ans:

$$\lim_{n\to\infty} \frac{2n^2+1}{n^2-3} = \lim_{n\to\infty} \frac{2+1/n^2}{1-3/n^2} = 2$$

The sequence converges to 2

2. (5pts)Determine if the series converges or diverges. If it converges, find the sum.

$$\sum_{n=1}^{\infty} (\frac{1}{3^k} + \frac{2}{k})$$

Ans:
(i) $\sum_{n=1}^{\infty} \frac{1}{3^k}$ converges (geometric series)
(ii) $\sum_{n=1}^{\infty} \frac{2}{k} = 2\sum_{n=1}^{\infty} \frac{1}{k}$ diverges (harmonic series)
Therefore $\sum_{n=1}^{\infty} (\frac{1}{3^k} + \frac{2}{k})$ diverges.

3. (**0pt**) Achilles and the tortoise-"You can never catch up."

"In a race, the quickest runner can never overtake the slowest, since the pursuer must first reach the point whence the pursued started, so that the slower must always hold a lead."
(Aristotle Physics VI:9, 239b15)

Being very fast, Greek hero Achilles gives the Tortoise a head start. But that would be a big mistake, claims Zeno, for then Achilles could never catch up. Why not? The proof is that by the time Achilles reaches the Tortoises starting point S_1, the Tortoise will have moved a little to S_2, but then by the time Achilles reaches S_2 the Tortoise will have moved on to S_3, but then by the time ...

Write your solutions as complete as possible. Working time: 10 minutes.