

Name: \_\_\_\_\_

## Quiz #10

**In class. 25 minutes. No textbook or notes or calculator. 30 points total.**

1. (5 pts) Determine, with explanation, whether the series is convergent or divergent.

$$\sum_{n=1}^{\infty} \frac{1}{n^2 + 4}$$

2. (10 pts) Find all values of  $p$  for which the series is convergent, and all values of  $p$  for which it is divergent. (*Hint.* Integral test.)

$$\sum_{n=1}^{\infty} n(1 + n^2)^p$$

3. (a) (5 pts) Compute and simplify the first two partial sums  $s_1, s_2$  of the series

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

- (b) (5 pts) Determine, with explanation, whether the series in (a) is convergent or divergent. (*Hint.* Integrating would be hard.)

4. (5 pts) For each real number  $x$  in the interval  $[0, 1]$  there is a decimal representation  $x = 0.d_1d_2d_3d_4\dots$ . Notice that each digit  $d_n$  is one of the numbers  $0, 1, 2, \dots, 9$ . The meaning of this representation *is* a series:

$$x = \frac{d_1}{10} + \frac{d_2}{10^2} + \frac{d_3}{10^3} + \frac{d_4}{10^4} + \dots = \sum_{n=1}^{\infty} \frac{d_n}{10^n}$$

- Show that this series always converges. (*Hint.* How big can  $d_n$  be? Comparison test.)