Answer all questions and show your work. Unsupported answers may receive *no credit*. You may not use a calculator on this quiz. Allow 15 minutes for the quiz.

Name: ______________________ Section: ______________________

1. (a) (3 points) Calculate the first 3 partial sums for the series

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

Solution:

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

$$\sum_{n=1}^{2} \frac{2+n}{1-2n} = \frac{2+1}{1-2*1} + \frac{2+2}{1-2*2} = \frac{3}{-1} + \frac{4}{-3} = -4\frac{1}{3}$$

$$\sum_{n=1}^{3} \frac{2+n}{1-2n} = \frac{2+1}{1-2*1} + \frac{2+2}{1-2*2} + \frac{2+3}{1-2*3} = \frac{3}{-1} + \frac{4}{-3} + \frac{5}{-5} = -5\frac{1}{3}$$

(b) (3 points) Does this series converge or diverge. Justify your answer!

Solution: Since

$$\lim_{x\to\infty} \frac{2+x}{1-2x} = \lim_{x\to\infty} \left(\frac{2}{1-2x} + \frac{x}{1-2x}\right) = \lim_{x\to\infty} \left(\frac{2}{1-2x} + \frac{1}{\frac{1}{x}-2}\right) = -\frac{1}{2}$$

the series diverges.

2. (4 points) Use the integral test to determine if the series

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

is convergent or divergent. Show your work!

Solution:

$$\int \frac{x}{x^2+1}dx = \int \frac{\frac{1}{2}du}{u} = \frac{1}{2}\ln|u| + C = \frac{1}{2}\ln(x^2+1) + C$$

$$\int_1^{\infty} \frac{x}{x^2+1}dx = \lim_{t\to\infty} \frac{1}{2}\ln(t^2+1) - \frac{1}{2}\ln(1^2+1)$$

This limit does not exist and so this series diverges.