

NAME: \_\_\_\_\_

**MATH 12003**

**HOMEWORK #5 (19 pts)**

**FALL 2009**

SHOW ALL WORK FOR FULL CREDIT — PLEASE CIRCLE YOUR FINAL ANSWER

DUE: TUESDAY, OCTOBER 20, 2009 AT THE BEGINNING OF CLASS

1. (1 pt each) Answer each question as “True” or “False”. If “True” give a brief justification. If “False” provide a counter-example.
  - (a) Convergent sequences are bounded.
  
  
  
  
  
  
  
  
  
  
  - (b) Convergent sequences are monotonic.
  
  
  
  
  
  
  
  
  
  
  - (c) If  $\sum a_n$  is divergent, then  $\{a_n\}$  is not a null sequence.
  
  
  
  
  
  
  
  
  
  
  - (d) If  $\{|a_n|\}$  is convergent, then so is  $\{a_n\}$ .
  
  
  
  
  
  
  
  
  
  
  - (e) An infinite series is a sequence.
  
  
  
  
  
  
  
  
  
  
  - (f) If  $\sum a_n$  is divergent, then  $\sum a_n^2$  is divergent.
  
  
  
  
  
  
  
  
  
  
  - (g) If  $\lim_{n \rightarrow \infty} (a_n + b_n)$  exists, then  $\lim_{n \rightarrow \infty} a_n$  and  $\lim_{n \rightarrow \infty} b_n$  both exist.

2. (2 pts each) Find the sum of the following series.

$$(a) \sum_{n=1}^{\infty} \frac{2^{3n+1}}{10^n}$$

$$(b) \sum_{n=1}^{\infty} \frac{3^{2n-1}}{5^{3n+1}}$$

$$(c) \sum_{n=2}^{\infty} \frac{6}{n^2 + 6n} \quad (\text{HINT: Use partial fraction decomposition.})$$

3. (2 pts each) Determine if each of the following series converges or diverges. Show all work and state the test you are using.

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

$$(b) \sum_{n=1}^{\infty} \frac{2n+5}{(n+1)^3}$$

$$(c) \sum_{n=1}^{\infty} \frac{n}{n^4+1}$$