

### Practice Test 3

1. In each of the following determine whether the series converges or diverges. Circle your answer. You do not need to show all your work.

(a)  $\sum_{k=0}^{\infty} \frac{(-1)^k}{\sqrt{k^2+3}}$ .

Converges                      Diverges

(b)  $\sum_{k=2}^{\infty} \frac{1}{(\ln n)^2 n}$ .

Converges                      Diverges

(c)  $\sum_{k=1}^{\infty} \frac{k^2}{(k^{1/3}-1)^9}$ .

Converges                      Diverges

(d)  $\sum_{k=2}^{\infty} \frac{k}{\ln(k)}$ .

Converges                      Diverges

2. In each of the following determine whether the series converges or diverges. Show your work, IN DETAIL.

(a)  $\sum_{k=1}^{\infty} \frac{2^k}{3^k+1}$ . (Hint:  $k^3 + 1 > k^3 \dots$ )

(b)  $\sum_{k=1}^{\infty} \frac{\cos(k)}{\sin^2(k)}$ .

3. A student steals a copy of the final from a faculty mail box. This causes the professor to go into a depression requiring a daily dose of anti-depressants. She takes 250 mg of Zoloft each day and after 24 hours there is approximately 2 % of the drug in her system.

Let  $Q_n$  =the amount of the drug in her system after the n'th dose is taken.

(a) Fill in the following table:

dose n	$Q_n$ = Zoloft in blood after n'th dose.
1	
2	
3	

(b) Find an expression for  $Q_5$ . If the answer involves a sum, write it in closed form.

(c) In the long run, (i.e., if the situation goes on ad infinitum) what will be the amount Zoloft in her system?

4. Consider the power series  $\sum_{k=0}^{\infty} \frac{2^k(x-1)^k}{k(k+1)}$ .

(a) Find the radius of convergence of this power series.

(b) Find the domain of this power series.

5. For each statement write whether the statement is true or false.

(a) If a series  $\sum a_n$  converges then  $\lim_{n \rightarrow \infty} a_n = 0$

TRUE                      FALSE

(b) If a power series  $\sum a_n(x-1)^n$  converges at  $x = -2$  and diverges at  $x = 7$ , then it converges at  $x = 3$ .

TRUE                      FALSE

(c) If  $p(x) = -5x + 7x^2$  is the degree two Taylor polynomial for a function  $f(x)$  near zero then  $f''(x) = 7$ .

TRUE                      FALSE

(d) If  $p(x) = -5x + 7x^2$  is the degree two Taylor polynomial for a function  $f(x)$  near zero then  $f(x)$  must be a decreasing function near  $x = 200$ .

TRUE                      FALSE