

## Math 231 Practice Exam #3

1. Consider the power series  $\sum_{n=0}^{\infty} \frac{x^n}{3^n(n^2 + 1)}$ .

Find the interval of convergence: \_\_\_\_\_

Find the radius of convergence: \_\_\_\_\_

2. Write the Maclaurin series for the function (a sum including all the terms). [For partial credit, you may write only the first 3 terms of the Maclaurin series]. Also, specify the range of  $x$  for which the function equals the series.

$$\int_0^x \frac{\ln(1 + 2t^2)}{t^2} dt$$

3. Use series to find  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - 1 - x/2}{\cos x - 1}$ . Only this method will be accepted. You may **not** use L'Hospital's Rule.
4. (a) Sketch the polar curve  $r = 2 - \sin 2\theta$ .
- (b) Find the intersection points of the two curves (a sketch is not required, but it may help):  $r = 1 - \cos \theta$  and  $\theta = \pi/4$ .
5. Describe the polar curve  $r = 2 - \sin 2\theta$  given in problem 4 by a set of parametric equations  $x = f(t)$ ,  $y = g(t)$  (be sure to specify the range of  $t$ ). Use this to
- (a) find  $\frac{dy}{dx}$  on this curve.
- (b) Write an integral for the area enclosed by the curve. Do not evaluate the integral.

**Extra credit (10 points).** Let  $f(x) = \sum_{n=0}^{\infty} \frac{x^{2n}}{n^2}$ . Find  $f^{(100)}(0)$ .