MATH 116-009 QUIZ 9 / 1 Dec 2006 Name:____________________________

It may or may not be useful to note that:

$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} - \cdots$ $\qquad \cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \frac{x^8}{8!} - \cdots$

$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \cdots$ $\qquad (1+x)^p = 1 + px + \frac{p(p-1)}{2!}x^2 + \frac{p(p-1)(p-2)}{3!}x^3 + \cdots$

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1. What is the radius of convergence of $\sum\limits_{n=0}^{\infty} \frac{3^n x^n}{n+2}$? (3 points)

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2. Suppose that the Taylor series for a function $f(x)$ is given to be $f(x) = 2x + \frac{8x^3}{2!} + \frac{32x^5}{4!} + \frac{128x^7}{6!} + \cdots$. What are $f(0)$? $f'''(0)$? $f^{(19)}(0)$? (3 points)

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3. A wandering polar weasel meditates for 2.718 minutes and then sketches the graph to the right, which shows three functions for values of x near 0. Astonishingly, one of these turns out to be exactly $\frac{1}{1-x^2}$, one $2 - \cos(x)$, while the third is another function that remains anonymous to protect its identity. Which of the graphs correspond to each of the two functions specified? (4 points)