AP Questions Tay/Mac #3

Name:___________________________________

2009 AP Test

The Maclaurin series for e^x is $e^x = 1+x+\frac{x^2}{2}+\frac{x^3}{6}+...+\frac{x^n}{n!}+...$ The continuous function *f* is defined by $f(x)=\frac{e^{(x-1)^2}-1}{(x-1)^2}$ for x≠1 and *f*(1) = 1. The function *f* has derivatives of all orders at x = 1.

(a) Write the first four nonzero terms and the general term of the Taylor series for $e^{(x-1)^2}$ about x = 1.
(b) Use the Taylor series found in part (a) to write the first four nonzero terms and the general term of the Taylor series for *f* about x = 1.
(c) Use the ratio test to find the interval of convergence for the Taylor series found in part (b).
(d) Use the Taylor series for *f* about x = 1 to determine whether the graph of *f* has any points of inflection.

2007 AP Test

Let *f* be the function given by $f(x)=e^{-x^2}$.

(a) Write the first four nonzero terms and the general term of the Taylor series for *f* about x = 0.
(b) Use your answer to part (a) to find $\lim_{x\to 0}\frac{1-x^2-f(x)}{x^4}$.
(c) Write the first four nonzero terms of the Taylor series for $\int_0^x e^{-t^2}\,dt$ about x = 0. Use the first two terms of your answer to estimate $\int_0^{1/2} e^{-t^2}\,dt$.
(d) Explain why the estimate found in part (c) differs from the actual value of $\int_0^{1/2} e^{-t^2}\,dt$ by less than $\frac{1}{200}$.

The function *f* is defined by the power series

2006 AP Test

$$f(x) = -\frac{x}{2}+\frac{2x^2}{3}-\frac{3x^3}{4}+\ldots+\frac{(-1)^n nx^n}{n+1}+\ldots$$

for all real numbers x for which the series converges. The function *g* is defined by the power series

$$g(x) = 1-\frac{x}{2!}+\frac{x^2}{4!}-\frac{x^3}{6!}+\ldots+\frac{(-1)^n x^n}{(2n)!}+\ldots$$

for all real numbers x for which the series converges.

(a) Find the interval of convergence of the power series for *f*. Justify your answer.

(b) The graph of $y = f(x) - g(x)$ passes through the point (0,-1). Find $y'(0)$ and $y''(0)$. Determine whether *y* has a relative minimum, a relative maximum, or neither at x = 0. Give a reason for you answer.