Name__________________ Date________

Worksheet: Taylor Series from AP BC Free Response Questions

Let f be a function that has derivatives of all orders for all real numbers. Assume $f(1) = 3$, $f'(1) = -2$, $f''(1) = 2$, and $f'''(1) = 4$.

1. Write the second-degree Taylor polynomial for f(x) about x = 1 and use it to approximate f(0.7).

2. Write the third-degree Taylor polynomial for f(x) about x = 1 and use it to approximate f(1.2).

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The Taylor series about x = 5 for a certain function converges to f(x) for all x in the interval of convergence. The nth derivative of f(x) at x = 5 is given by $f^{(n)}(5) = \dfrac{(-1)^n n!}{2^n (n+2)}$, and $f(5) = \dfrac{1}{2}$.

3. Write the third-degree Taylor polynomial for f(x) about x = 5.

4. Find the radius of convergence of the Taylor series representation for f(x) about x = 5.

The Maclaurin series for f(x) is given by $1 + \frac{x}{2!} + \frac{x^2}{3!} + \frac{x^3}{4!} + \ldots + \frac{x^n}{(n+1)!} + \ldots$

5. Find $f'(0)$ and $f^{(17)}(0)$.

6. Let $g(x) = xf(x)$. Write the Maclaurin series for $g(x)$, showing the first three nonzero terms and the general term.

7. Let f be the function given by $f(x) = \ln(5 - x)$. Find the third degree Taylor polynomial for f about $x = 4$.

8. If $f(x) = x\cos(2x)$, write the Taylor Series for f about $x = 0$?