Math 604 – AP Calculus BC **Name______________________________**

Packet A: Maclaurin & Taylor Polynomials (corresponds to Section 9.2)

Maclaurin Series at $c = 0$: $f(x) \approx f(0) + f'(0)x + \frac{f''(0)}{2!}x^2 + \ldots + \frac{f^{(n)}(0)}{n!}x^n + \ldots = \sum_{k=0}^{\infty} \frac{f^{(k)}(0)}{k!}x^k$

Find the Maclaurin Polynomials of order 4 for $f(x)$ and use it to approximate $f(0.25)$.

1. $f(x) = e^{2x}$

2. $f(x) = \sin 2x$

3. $f(x) = \ln(x+1)$

4. $f(x) = \tan^{-1} x$

Taylor Series at $x = c$:

$$f(x) \approx f(c) + f'(c)(x-c) + \frac{f''(c)}{2!}(x-c)^2 + \ldots + \frac{f^{(n)}(c)}{n!}(x-c)^n + \ldots = \sum_{k=0}^{\infty} \frac{f^{(k)}(c)}{k!}(x-c)^k$$

Find the Taylor Polynomials of order 3 centered at the given points.

5. $f(x) = e^x;\ c = 2$

6. $f(x) = \tan x;\ c = \frac{\pi}{4}$

7. $f(x) = \tan^{-1} x;\ c = 1$

8. Find the Taylor Polynomial of order 3 centered at $c = 2$ for $f(x) = x^3 - 2x^2 + 3x + 5$ and show that it is an exact representation of $f(x)$.

9. Find the Maclaurin Polynomial of order n for $f(x) = 1/(1 - x)$. Then use it with $n = 4$ to approximate each of the following.

(a) $f(0.1)$ (b) $f(0.5)$ (c) $f(0.9)$ (d) $f(2)$

How does this example show you that the Maclaurin series can be exceedingly poor if x is far from zero?