$P_n(x) = f(c) + f'(c)(x - c) + \frac{f''(c)}{2!}(x - c)^2 + ... + \frac{f^{(n)}(c)}{n!}(x - c)^n$ is called the **nth Taylor Polynomial** for f at c.

If c = 0,

then $P_n(x) = f(0) + f'(0)x + \frac{f''(0)}{2!}x^2 + ... + \frac{f^{(n)}(0)}{n!}x^n$ is called the **nth Maclaurin Polynomial** for f.

$\sum_{n=0}^{\infty} \frac{f^{(n)}(c)}{n!}(x - c)^n = f(c) + f'(c)(x - c) + ... + \frac{f^{(n)}(c)}{n!}(x - c)^n + ...$ is called the **Taylor series** for f(x) at c.

Moreover, if c = 0, then the series is the **Maclaurin series** for f.

Each Term of a Taylor Series has 3 parts:

1. $n^{th}$ Derivative of f(x) evaluated at c
2. $(x - c)^n$
3. n!

n goes form 0 to infinity

The $0^{th}$ derivative is the function itself

"We build a Taylor Series Term-By-Term"

"We build each term Part-By-Part"

$\frac{f^{(n)}(c)}{n!}(x - c)^n$

**Alternating Polynomial Error**

The Error when the Convergent Alternating Series, $f(x) = \sum_{k=1}^{\infty} (-1)^k a_k(x)$, is approximated by the Alternating Finite Polynomial, $f(x) = \sum_{k=1}^{n} (-1)^k a_k(x)$ for a particular value of x,

is less than $(a_{n+1})$, the absolute value of the next term.

**Taylor Polynomial Error**

The Error when the Taylor Series, $\sum_{k=0}^{\infty} \frac{f^{(k)}(c)(x - c)^k}{k!}$, is approximated by the Taylor Polynomial, $\sum_{k=0}^{n} \frac{f^{(k)}(c)(x - c)^k}{k!}$ for a particular value of x,

is less than $\frac{f^{(k+1)}(z)(x - c)^{k+1}}{(k + 1)!}$ where z is between x and c and gives the maximum value of $f^{(k+1)}(z)$.

AP Calculus BC 2 Assignment 210 Monday, February 16, 2015 Hour Name

1. Construct, **from scratch**, a 2nd Degree (3 terms) Taylor Polynomial for $f(x) = \frac{1}{x}$ , centered at c = 2

2. How close is the above approximation for f(2.1), and is the error within the Alternator Series Error Formula?

3. Write the 3rd Degree Maclaurin polynomial for $f(x) = e^{3x}$ in SIMPLIFIED-REDUCED Form, based on what you know about the series for $e^x$.

4. How close is the above approximation for f(0.2), and is the error within the Taylor Series Error Formula?

5. Find a Taylor Poly for $f(x) = \frac{2}{x^2}$ , n = 4, c = 2

6. Construct from scratch the 3rd Degree Taylor Polynomial centered at 1 for $f(x) = \sqrt{x}$