Taylor Polynomials 1

Name: Block: Seat:

A polynomial function can be approximate most any function f near some value of $x = c$. If f has n derivitives at c, then the polynomial

$$P_n(x) = f(c)+f'(c)(x-c)+\frac{f''(c)}{2!}(x-c)^2+\frac{f'''(c)}{3!}(x-c)^3+\cdots+\frac{f^{(n)}(c)}{n!}(x-c)^n$$

is called the **nth Taylor polynomial for f at c**
If $c = 0$ then

$$P_n(x) = f(0)+f'(0)(x)+\frac{f''(0)}{2!}(x)^2+\frac{f'''(0)}{3!}(x)^3+\cdots+\frac{f^{(n)}(0)}{n!}(x)^n$$

is called the **nth Maclaurin polynomial** for f.

1. $f(x) = e^x$
   (a) 1st degree Maclaurin polynomial

   (b) 3rd degree Maclaurin polynomial

   (c) nth degree Maclaurin polynomial

2. 4th degree Taylor polynomial for $f(x) = \ln x$ centered at $c = 1$
   (a) Find the 1st to fourth derivatives

   (b) Find $f'(c)$, $f''(c)$, $f'''(c)$, $f^{(4)}(c)$:

   (c) 4th degree Taylor polynomial:

3. 4th degree Maclaurin polynomial for $f(x) = \cos x$ (centered at $c = 0$)
   (a) Find the 1st to fourth derivatives

   (b) Find $f'(0)$, $f''(0)$, $f'''(0)$, $f^{(4)}(0)$:

   (c) 4th degree Maclaurin polynomial:

4. 4th degree Taylor polynomial for $f(x) = \sin x$ centered at $c = \frac{\pi}{6}$
   (a) Find the 1st to fourth derivatives

   (b) Find $f'(c)$, $f''(c)$, $f'''(c)$, $f^{(4)}(c)$:

   (c) 4th degree Taylor polynomial: