$y = \tan x \qquad a = 0$

$f(0) = 0$

$f'(x) = \sec^2 x \qquad f'(0) = 1$

$f''(x) = 2\sec x \cdot \sec x \tan x = 2(1)(1)(0) = 0$

$2\sec^2 x \tan x$

$f'''(x) = 2\left[2\sec x \sec x \tan x \tan + \sec^2 x \sec^2 x\right]$

$= 2\left(0 + (1)(1)\right) = 2$

$$T_3(x) = 0 + \frac{1x}{1!} + \frac{0 \cdot x^2}{2!} + \frac{2 \cdot x^3}{3!}$$

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$$

Converges on $(-\infty, \infty)$

$$\frac{1}{1-x} = 1 + x + x^2 + x^3 + \cdots$$

Converges on $(-1, 1)$

$$\frac{1}{1+x} = 1 - x + x^2 - x^3 + \cdots$$

Converges on $(-1, 1)$

$$e^{x} = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \cdots$$

$$e^{3x} = 1 + \frac{3x}{1!} + \frac{(3x)^2}{2!} + \frac{(3x)^3}{3!} + \frac{(3x)^4}{4!} + \cdots$$

$$e^{-x} = 1 - \frac{x}{1!} + \frac{x^2}{2!} - \frac{x^3}{3!} + \frac{x^4}{4!} - $$

$$e^x = 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \dots \frac{x^n}{n!}$$

to find a Taylor series for $e^{(x-1)^2}$ use substitution:

$$e^{(x-1)^2} = 1 + (x-1)^2 + \frac{((x-1)^2)^2}{2} + \frac{((x-1)^2)^3}{6} + \dots$$

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