Taylor Expansion

$$f(x) = \sum_{n=0}^{\infty} \left(\frac{1}{n!}\right) \cdot f^{(n)}(a) \cdot (\mathrm{x} - \mathrm{a})^{\mathrm{n}}$$

$$= f(a) + 1! \cdot f'(a) \cdot (\mathrm{x} - \mathrm{a}) + \frac{1}{2!} \cdot f''(a) \cdot (x - a)^2 + \frac{1}{3!} \cdot f^{(3)}(a) \cdot (\mathrm{x} - \mathrm{a})^3 + \cdots$$

Approximations

$\tan(\theta) \approx \theta$ *1% Relative Error at ~0.176 radians*

$\sin(\theta) \approx \theta$ *1% Relative Error at ~0.244 radians*

$\cos(\theta) \approx 1 - \frac{\theta^2}{2}$ *1% Relative Error at ~0.664 radians*

$When\ x \ll 1$:

$\frac{1}{1+x} \approx 1 - x$

$e^x \approx 1 + x$

$\ln(1 + x) \approx x$

Fourth Order Runge-Kutta Method

$$y(x + \Delta x) \approx y(x) + \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$$

$$k_1 = f(x, y)\Delta x$$

$$k_2 = f\left(x + \frac{1}{2}\Delta x, y + \frac{1}{2}k_1\right)\Delta x$$

$$k_3 = f\left(x + \frac{1}{2}\Delta x, y + \frac{1}{2}k_2\right)\Delta x$$

$$k_4 = f(x + \Delta x, y + k_3)\Delta x$$