

$$L = \lim_{n \rightarrow \infty} \left( \frac{a_{n+1}}{a_n} \right) \quad \text{if } L < 1 \therefore \text{converges}$$

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

expand functions

$$\begin{aligned} \text{a) } f(x) &= \sin(2x), \quad x_0 = 0 \\ &= \sin(0) + \frac{2\cos(0)}{1}(x) - \frac{4\sin(0)}{2}(x^2) - \frac{8\cos(0)}{6}(x^3) \\ &= 0 + 2x - \frac{8}{6}x^3 \end{aligned}$$

$$\begin{aligned} \text{b) } f(x) &= \ln(2x), \quad x_0 = 1 \\ &= \ln(2) + \frac{2}{x}(x-1) - \frac{2}{x^2} \frac{1}{2}(x-1)^2 + \frac{4}{x^3} \frac{1}{6}(x-1)^3 \end{aligned}$$

$$\begin{aligned} \text{c) } f(x) &= e^{2x}, \quad x_0 = 1 \\ &= e^2 + 2e^2(x-1) + 4e^2 \frac{1}{2}(x-1)^2 + 8e^2 \frac{1}{6}(x-1)^3 \end{aligned}$$

$$\begin{aligned} \text{d) } f(x) &= 3x^2 - 2x + 5, \quad x_0 = 0 \\ &= 5 - 2(x) + 3(x^2) \end{aligned}$$

$$\begin{aligned} \text{e) } f(x) &= 3x^2 - 2x + 5, \quad x_0 = 1 \\ &= 6 + 4(x-1) + 3(x-1)^2 = 6 + 4x - 4 + 3x^2 - 6x + 3 \\ &= 5 - 2x + 3x^2 \end{aligned}$$

$$\text{f) } f(x) = (3x^2 - 2x + 5)^{-1}, \quad x_0 = 1$$

$$\text{g) } f(x) = \cosh(x-3), \quad x_0 = 1$$

$$\begin{aligned} \text{h) } f(x) \quad x_0 = a \\ f(a) + f'(a)(x-a) + f''(a) \frac{1}{2}(x-a)^2 + f'''(a) \frac{1}{6}(x-a)^3 + \dots \end{aligned}$$

$$\text{i) } f(x) = f'(x)(a-x) + f''(x) \frac{1}{2}(a-x)^2 + f'''(x) \frac{1}{6}(a-x)^3 + \dots$$

j) ?