Maclaurin Series

Chain Rules (just in case)

$$f(x) = \sqrt{1+4x} = (1+4x)^{1/2}$$

$$f'(x) = \frac{1}{2}(1+4x)^{-1/2}(4)$$

$$f''(x) = -\frac{1}{4}(1+4x)^{-3/2}(4)(4)$$

1. Multiply the power of the bracket by the coefficient.
2. Reduce the power by 1.
3. Multiply the remained/result by the first derivate of the bracket.

Extended

$$y = (x^2+2x+1)^3$$

Let $u = x^2+2x+1 \Rightarrow y = u^3$

$$\frac{du}{dx} = 2x+2 \quad \text{&} \quad \frac{dy}{du} = 3u^2$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} \Rightarrow 3u^2 \times (2x+2)$$

$$= 3(x^2+2x+1)^2(2x+2)$$

Ranges

$$(3+x)^{-1} = 3^{-1}\left(1+\frac{x}{3}\right)^{-1}$$

$$\Rightarrow \because -1 < x < 1$$

$$-1 < x/3 < 1 \Rightarrow -3 < x < 3$$

MAY BE HELPFUL TO PUSH FACTORS FROM BRACKETS

Binomial Series

$$(1+x)^n = 1 + nx + \dots$$

$$\Rightarrow (2+4x)^3 = 2^3(1+2x)^3$$

$$= 2^3\left(1 + 3(2x) + \frac{3(2)}{2\times 1}(2x)^2 + \dots\right)$$

$$= 8\left(1 + 6x + 12x^2 + \dots\right)$$

$$= 8 + 48x + 96x^2 + \dots$$