

Binomial Expansion – To Be Marked

$$(1 + 3x)^{-2} = 1 + -2 \times 3x + \frac{-2 \times -3}{2!} \times 3x^2 = 1 - 6x + 9x^2$$

Valid for $-1 < x < 1$

$$(1 + x)^{\frac{1}{2}} = 1 + \frac{1}{2} \times x + \frac{\frac{1}{2} \times (\frac{1}{2} - 1)}{2!} \times x^2 = 1 + \frac{1}{2}x - \frac{1}{8}x^2$$

Valid for $-1 < x < 1$

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

$$= 3 + \frac{1}{2}x - \frac{1}{24}x^2$$

Valid for $-3 < x < 3$

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

Valid for $-4 < x < 4$

$$(1 - 2x)^{-\frac{1}{2}} = 1 + -\frac{1}{2} \times -2x + \frac{-\frac{1}{2} \times -\frac{3}{2}}{2!} \times -2x^2 = 1 + x - \frac{3}{2}x^2$$

Valid for $\frac{1}{2} < x < -\frac{1}{2}$

$$(1 + 3x)^{-3} = 1 + -3 \times 3x + \frac{-3 \times -4}{2!} \times (3x)^2 = 1 - 9x + 54x^2$$

Valid for $-3 < x < 3$