Set 1

Problem 1

(a)

$$e^{-2x} = 1 - 2x + \frac{4x^2}{2!} - \frac{8x^3}{3!} + \frac{16x^4}{4!} - \frac{32x^5}{5!} + \cdots$$
$$= \sum_{n=0}^{\infty} (-2)^n \frac{x^n}{n!}.$$

(b)

$$(1+x)^3 = 1 + 3x + 3x^2 + x^3 = \sum_{n=0}^{3} \binom{3}{n} x^n.$$

(c)

If $0 < r < 1$,

$$\sum_{n=0}^{\infty} r^n = \frac{1}{1-r}.$$

Therefore,

$$\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n.$$