b) $f(x) = \dfrac{4}{x+2}$ we must first get this in the form of the foundation function

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

$$\frac{1}{1-\text{argument}} = \sum_{n=0}^{\infty} (\text{argument})^n$$

$$= 4 \cdot \frac{1}{2+x}$$

$$= 4 \cdot \frac{1}{2(1+\frac{x}{2})}$$

$$= \frac{4}{2} \cdot \frac{1}{1-(-\frac{x}{2})}$$

$$= 2 \cdot \frac{1}{1-(-\frac{x}{2})}$$

$$= 2 \cdot \sum_{n=0}^{\infty} \left(-\frac{x}{2}\right)^n =$$

$$\left(-\frac{x}{2}\right)^n = (-1)^n \cdot \left(\frac{x}{2}\right)^n = (-1)^n \cdot \frac{x^n}{2^n}$$

If we multiply by the "outer" 2, it simplifies, a little, with the denominator

(i) $$= \boxed{2 \cdot \sum_{n=0}^{\infty} (-1)^n \cdot \frac{x^n}{2^n}} \quad \text{or} \quad \boxed{\sum_{n=0}^{\infty} (-1)^n \cdot \frac{x^n}{2^{n-1}}}$$

(ii) expanded form:

$n=0 \qquad n=1 \qquad n=2 \qquad n=3$

$$= 2 \cdot \frac{1}{1} - 2 \cdot \frac{x}{2} + 2 \cdot \frac{x^2}{4} - \frac{2 \cdot x^3}{8}$$

$$= \boxed{2 - x + \frac{x^2}{2} - \frac{x^3}{4} + \cdots}$$