

Partial Fraction Decomposition

$$\frac{x+1}{(x-1)(x+2)} = \frac{a}{x-1} + \frac{b}{x+2} \quad (\text{trial solution})$$

Follow rules

solve for a & b

$$\cancel{(x-1)(x+2)} \left(\frac{x+1}{\cancel{(x-1)(x+2)}} \right) = \left(\frac{a}{x-1} + \frac{b}{x+2} \right) (x-1)(x+2)$$

$$x+1 = a(x+2) + b(x-1)$$

$$\underline{x} + \underline{1} = \underline{ax} + \underline{2a} + \underline{bx} - \underline{b}$$

$$\underline{x^1}: \quad 1 = a + b$$

$$\underline{x^0}: \quad 1 = 2a - b$$

use elimination

$$2 = 3a \Rightarrow a = \frac{2}{3}$$

$$b = \frac{1}{3}$$

so

$$\boxed{\frac{x+1}{(x-1)(x+2)} = \frac{2}{3(x-1)} + \frac{1}{3(x+2)}}$$