



Air maths tuition

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## Binomial Expansion (partial fractions type)

Express  $\frac{5x-1}{(2-x)(1+x)}$  in ascending powers of  $x$  up to the term in  $x^2$  and state the range of values for  $x$  for which it is valid.

$$\frac{5x-1}{(2-x)(1+x)} \equiv \frac{3}{2-x} - \frac{2}{1+x}$$

$$\equiv 3(2-x)^{-1} - 2(1+x)^{-1}$$

$$\equiv 3 \left[ 2 \left( 1 - \frac{x}{2} \right) \right]^{-1} - 2(1+x)^{-1}$$

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

$$\equiv \frac{3}{2} \left[ 1 + (-1) \left( -\frac{x}{2} \right) + \frac{(-1)(-2)}{2!} \left( -\frac{x}{2} \right)^2 + \dots \right] - 2 \left[ 1 + (-1)x + \frac{(-1)(-2)}{2!} x^2 + \dots \right]$$

$$\equiv \frac{3}{2} + \frac{3}{4}x + \frac{3x^2}{8} + \dots - 2 + 2x - 2x^2 + \dots$$

$$\equiv -\frac{1}{2} + \frac{11}{4}x - \frac{13}{8}x^2 + \dots \quad \text{valid for } -1 < x < 1$$

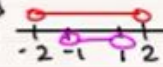
$$\left[ 2 \left( 1 - \frac{x}{2} \right) \right]^{-1} \equiv 2^{-1} \left( 1 - \frac{x}{2} \right)^{-1}$$

$$\equiv \frac{1}{2} \left( 1 - \frac{x}{2} \right)^{-1}$$

\* valid  $-1 < -\frac{x}{2} < 1$

$\therefore -2 < x < 2$

\* valid  $-1 < x < 1$



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