

The function  $f$  is defined by  $f(x) = \frac{6x+1}{2x-1}$ ,  $x \in \mathbb{R}, x \neq \frac{1}{2}$

- Write  $f(x)$  in the form  $A + \frac{B}{2x-1}$  where A and B are constants
- Sketch the graph of  $y = f(x)$  stating the equations of any asymptotes and the coordinates of any intercepts with the axes

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a) 
$$\frac{6x+1}{2x-1} \equiv A + \frac{B}{2x-1}$$

$y = A$  is the equation of the horizontal asymptote

$f(x) = \frac{6x+1}{2x-1}$  has a horizontal asymptote at  $y = 3$

$$\frac{6x+1}{2x-1} \equiv 3 + \frac{B}{2x-1}$$

$$\frac{6x+1}{2x-1} \equiv \frac{3(2x-1) + B}{2x-1}$$

$$6x+1 \equiv 3(2x-1) + B$$

$$6x+1 \equiv 6x-3+B$$

$$B = 4$$

$$\frac{6x+1}{2x-1} \equiv 3 + \frac{4}{2x-1}$$

- b) The function has

a horizontal asymptote at  $y = 3$

a vertical asymptote at  $x = \frac{1}{2}$

The y intercept occurs when  $x = 0$

$$y = \frac{0+1}{0-1}$$

$$y = -1$$

The x intercept occurs when  $y = 0$

$$\frac{6x+1}{2x-1} = 0$$

$$6x+1 = 0$$

