$$s = 30t - \frac{9}{4}t^2$$

$$v = \frac{ds}{dt} = 80 - \frac{2(9)}{(4)}t = 30 - \frac{9}{2}t$$

$$a = \frac{dv}{dt} = -\frac{9}{2}$$

(i) Speed at $t = 2$, $v = 30 - \frac{9}{2}(2) = 21$ m/s

(ii) $V = 30 - \frac{9}{2}t = 0$

$60 - 9t = 0 \Rightarrow 9t = 60 \Rightarrow t = \frac{60}{9} = \frac{20}{3}$ secs

(iii) distance traveled $t = \frac{20}{3} = ?$

$$S = 30\left(\frac{20}{3}\right) - \frac{9}{4}\left(\frac{20}{3}\right)^2 = 100\text{ m}$$

$$x^3 - 4x - 2 = 0$$

$$f(2) = (2)^3 - 4(2) - 2 = -2 < 0$$

$$f(3) = (3)^3 - 4(3) - 2 = 13 > 0$$

$\Rightarrow$ Root between 2 and 3.

Remember...

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$$

$$f(x) = x^3 - 4x - 2$$

$$f'(x) = 3x^2 - 4$$

$$x_2 = 2 - \frac{(2)^3 - 4(2) - 2}{3(2)^2 - 4} = 2 - \frac{-2}{8} = \frac{9}{4}$$

$$x_3 = \frac{9}{4} + \frac{(9/4)^3 - 4(9/4) - 2}{3(9/4)^2 - 4} = 2.22 \text{ (2dp)}$$

Asymptotes $y = \dfrac{x}{x+2}$

$x = -2$

$$\lim_{x \to \infty} y = \frac{\cancel{x}\,1}{\cancel{x}\left(1 + \frac{2}{x}\right)} = \frac{1}{1} = 1$$

$y = 1$

No Turning points

QUOTIENT

$$f'(x) = \frac{(x+2)(1) - (x)(1)}{(x+2)^2} = \frac{x+2-x}{(x+2)^2} = \frac{2}{(x+2)^2} > 0$$

$\Rightarrow$ no turning point.

$$f''(x) = -4(x+2)^{-3} \neq 0 \Rightarrow \text{no pt. of inflection}$$

$f'(x) \leq 1 \Rightarrow \dfrac{2}{(x+2)^2} \leq 1$

$\Rightarrow 2 \leq (x+2)^2$

$\Rightarrow (x+2)^2 \geq 2$

Solve $(x+2)^2 = 2$.

$\Rightarrow (x+2) = \pm\sqrt{2}$

$\therefore x = \sqrt{2} - 2, -\sqrt{2} - 2$

$\boxed{(x+2)^2 \geq 2}$ .....**Test Box**

$\boxed{-\sqrt{2}-2}$ ≈ -3.4 $\qquad$ $\boxed{\sqrt{2}-2}$ ≈ -0.6

-4	-1	0
$(-4+2)^2 \geq 2$	$(-1+2)^2 \geq 2$	$(0+2)^2 \geq 2$
$\Rightarrow (-2)^2 \geq 2$	$\Rightarrow (1)^2 \geq 2$	$\Rightarrow (2)^2 \geq 2$
$\Rightarrow 4 \geq 2$	$\Rightarrow 1 \geq 2$	$\Rightarrow 4 \geq 2$
Correct	Wrong	Correct

Answer: $x \leq -2 - \sqrt{2},\ x \geq -2 + \sqrt{2}$