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181ENG061004

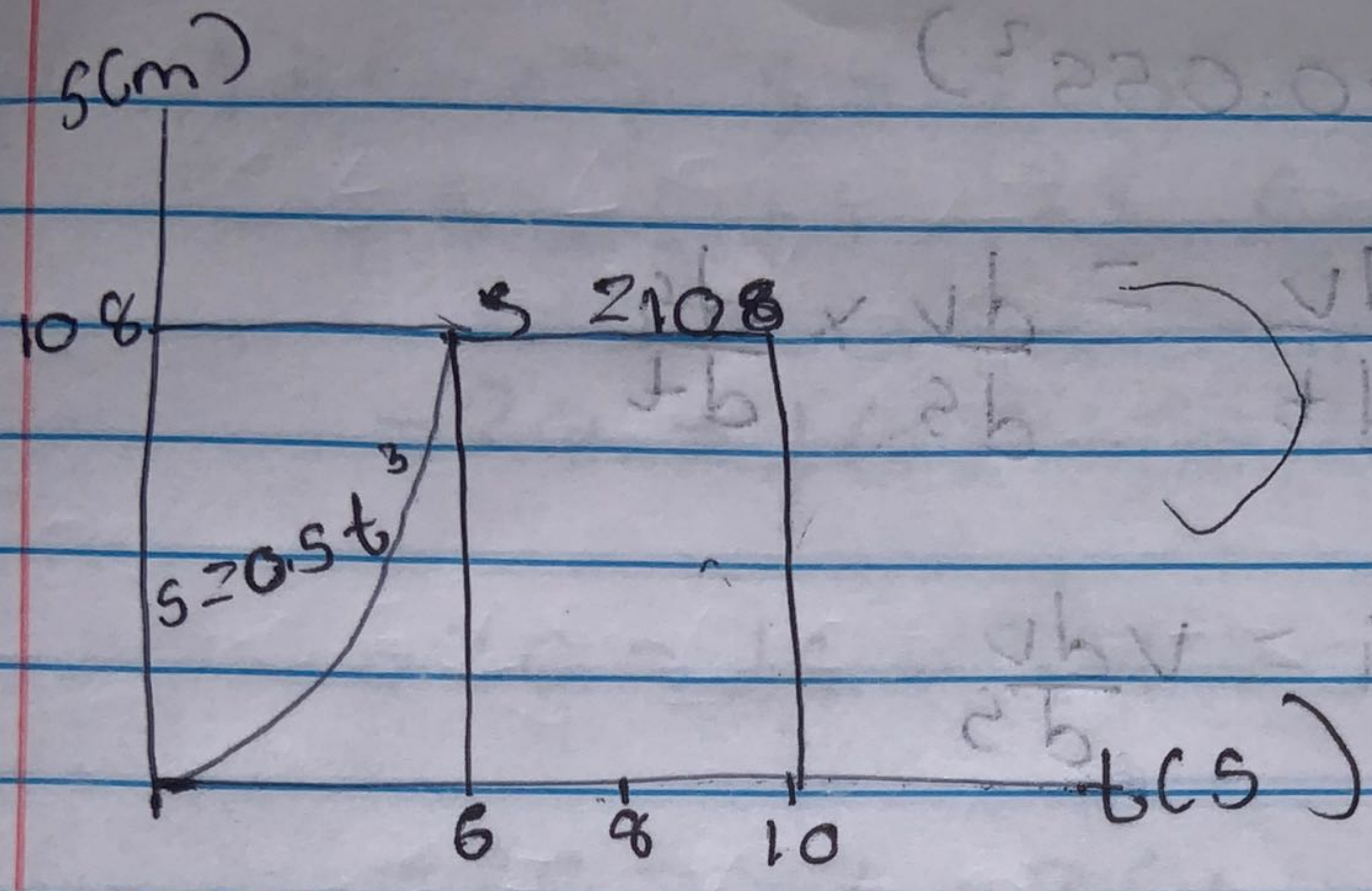
Mechanical Engineering

ENG 234

Mechanics

Assignment

①



$$s = 0.5t^3$$

$$\dot{v} = \frac{ds}{dt} = \frac{d}{dt}(0.5t^3) = 1.5t^2$$

$$\text{② } \underline{v} = \frac{ds}{dt} = 1.5t^2 \text{ m/s}$$

$$6 \leq t \leq 10; \quad s = 10$$

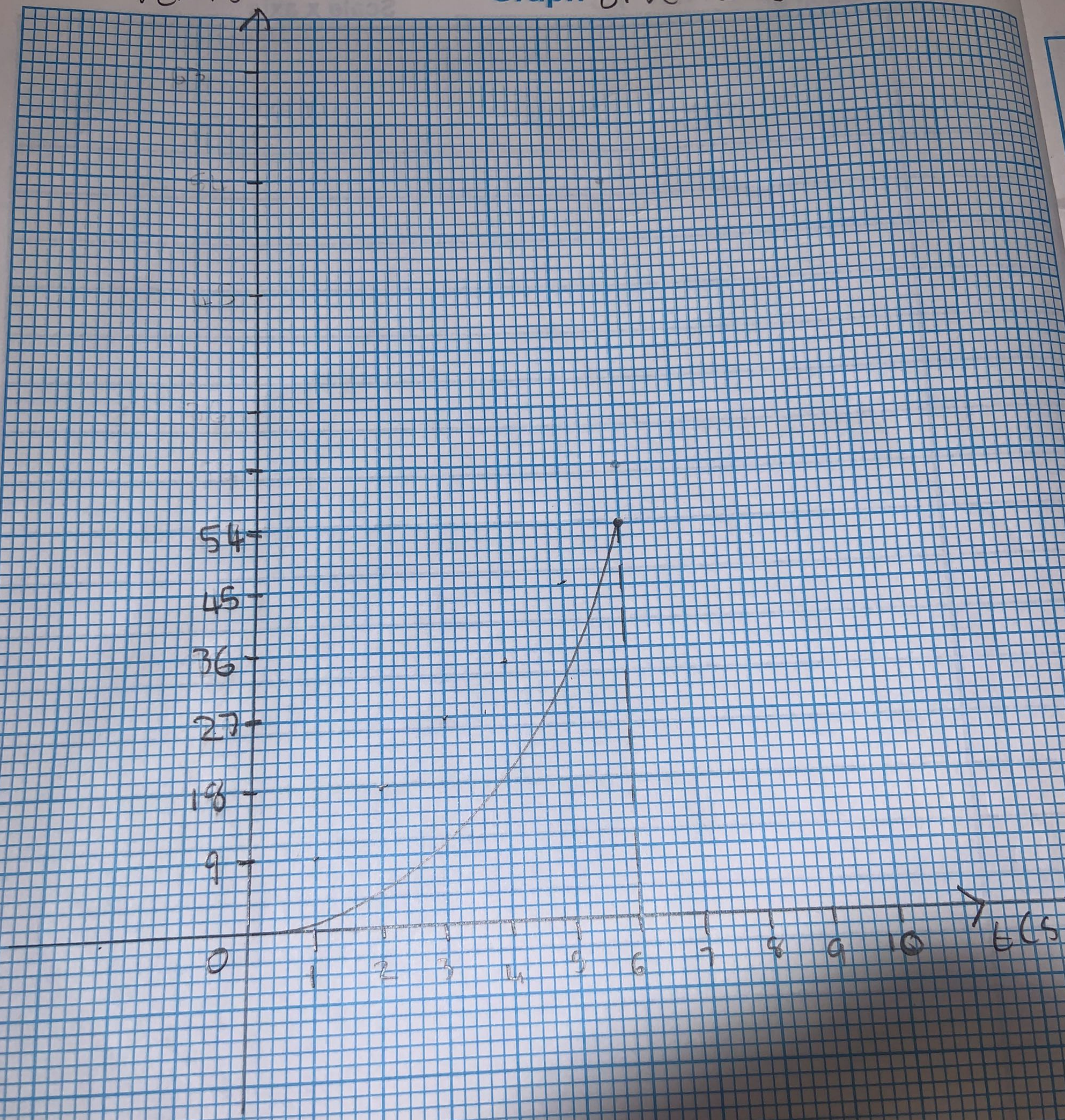
$$v = \frac{ds}{dt} = 0$$

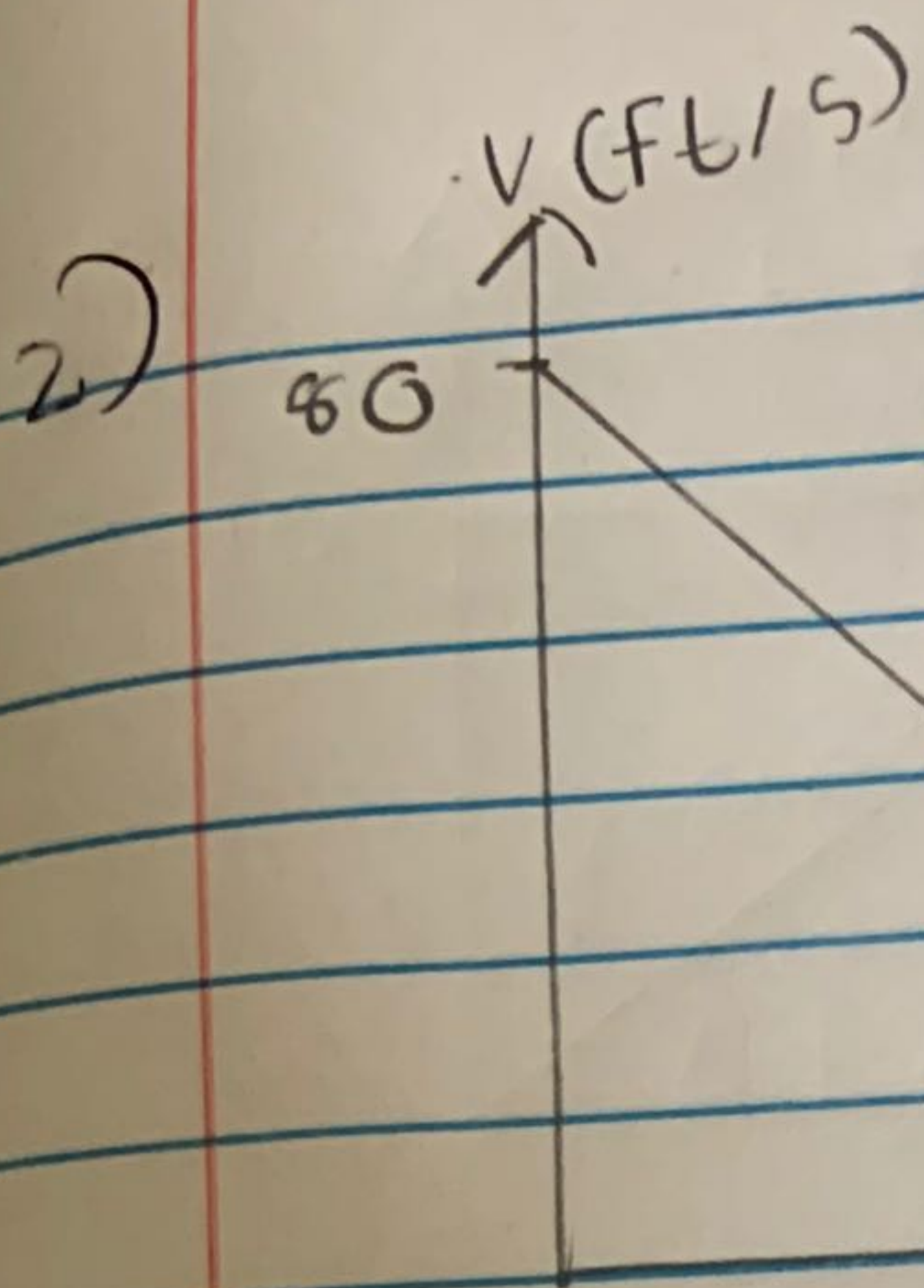
$$v = 1.5(6)^2 = 54 \text{ m/s}$$

Question 1

$V(m/s)$

Graph of $V(m/s)$ against $t(s)$





$$v = \frac{ds}{dt}$$

$$\therefore ds = v dt$$

$$0 \leq t \leq 20, v = -4t + 80$$

$$\therefore s = \int_0^t (-4t + 80) dt$$

$$s = \left[-\frac{4t^2}{2} + \frac{80t}{1} \right]_0^t$$

$$s = -2t^2 + 80t - 0$$

$$\text{at } t = 20$$

$$s = -2(20)^2 + 80(20)$$

$$= -800 + 1600$$

$$s = 800 \text{ ft}$$

$$\text{at } t = 0$$

$$s = -2(0)^2 + 80(0)$$

$$s = 0 \text{ ft}$$

$$a = \frac{dv}{dt}$$

$$a = -4 \text{ ft/s}^2$$

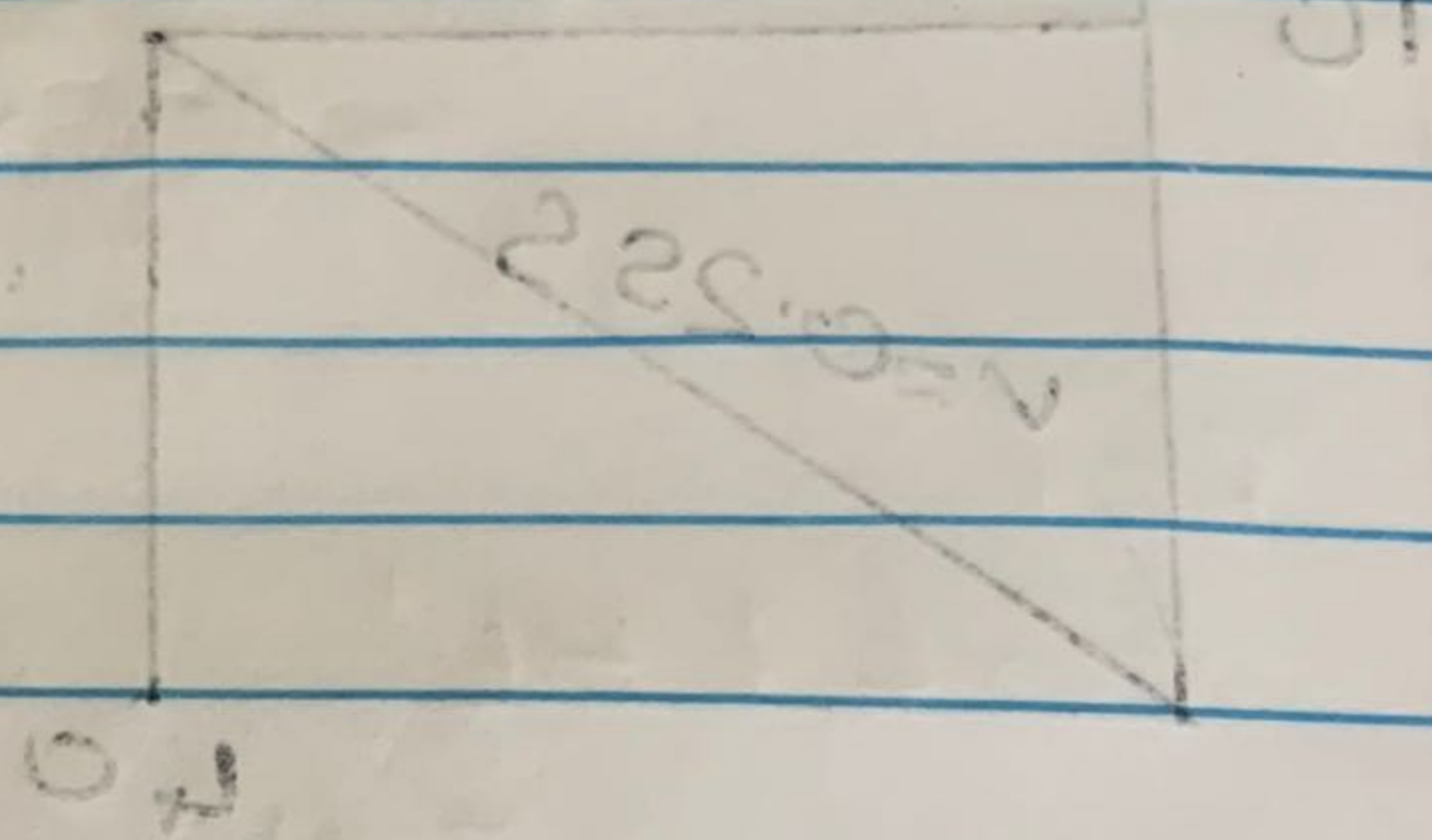
$$0 \leq t \leq 20 \Rightarrow v = -4t + 80$$

$$a = \frac{d}{dt} (-4t + 80)$$

$$a = -4 \text{ ft/s}^2$$

(cm/s)

(3)



$$20 \cdot 0 + 225 \cdot 0 = 0$$

$$(21 \text{ m}) \cdot 225 \cdot 0 = 0$$

$$A + 2 = 1 \text{ m}$$

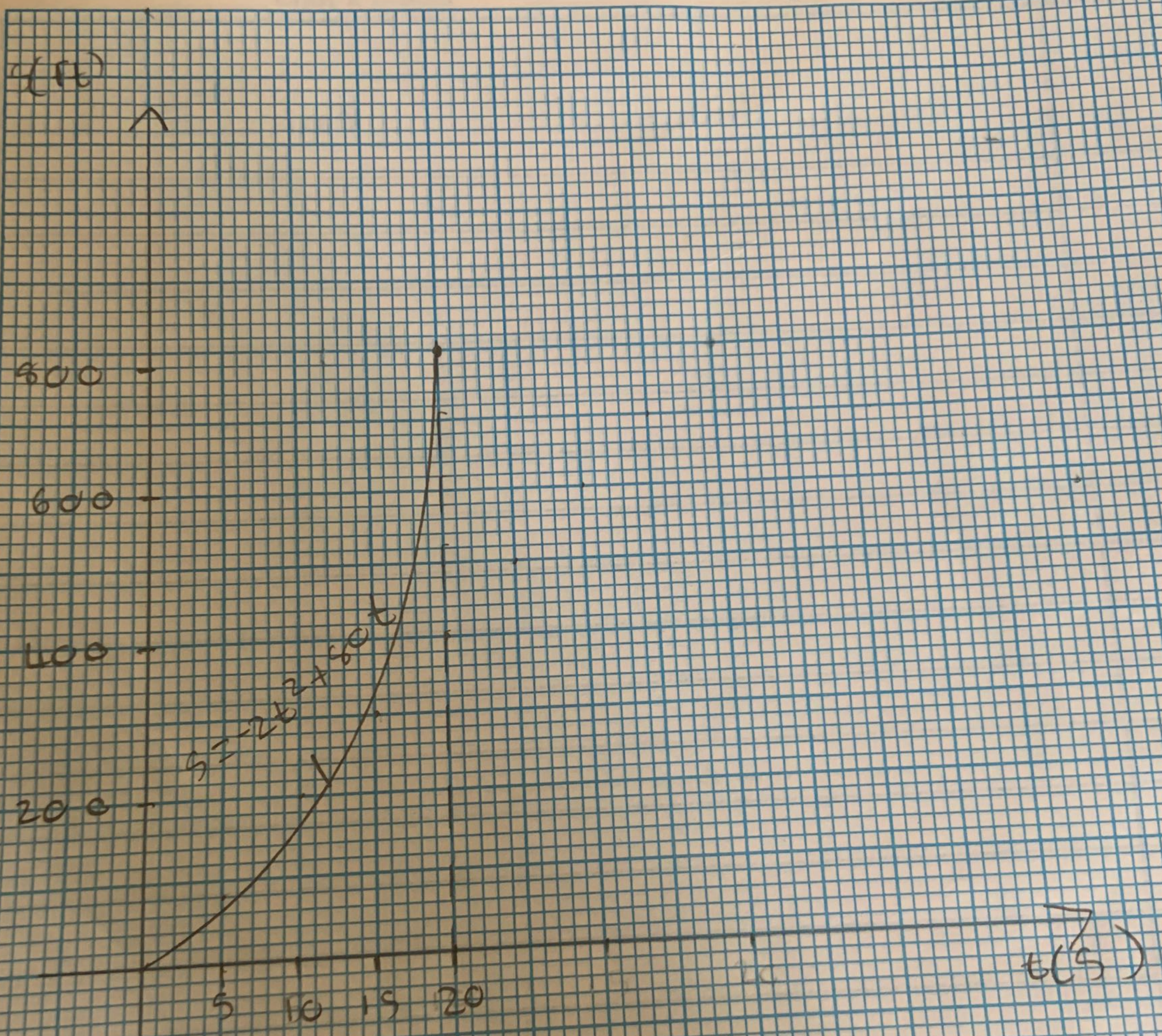
$$0.1 \cdot 225 \cdot 0 = 0$$

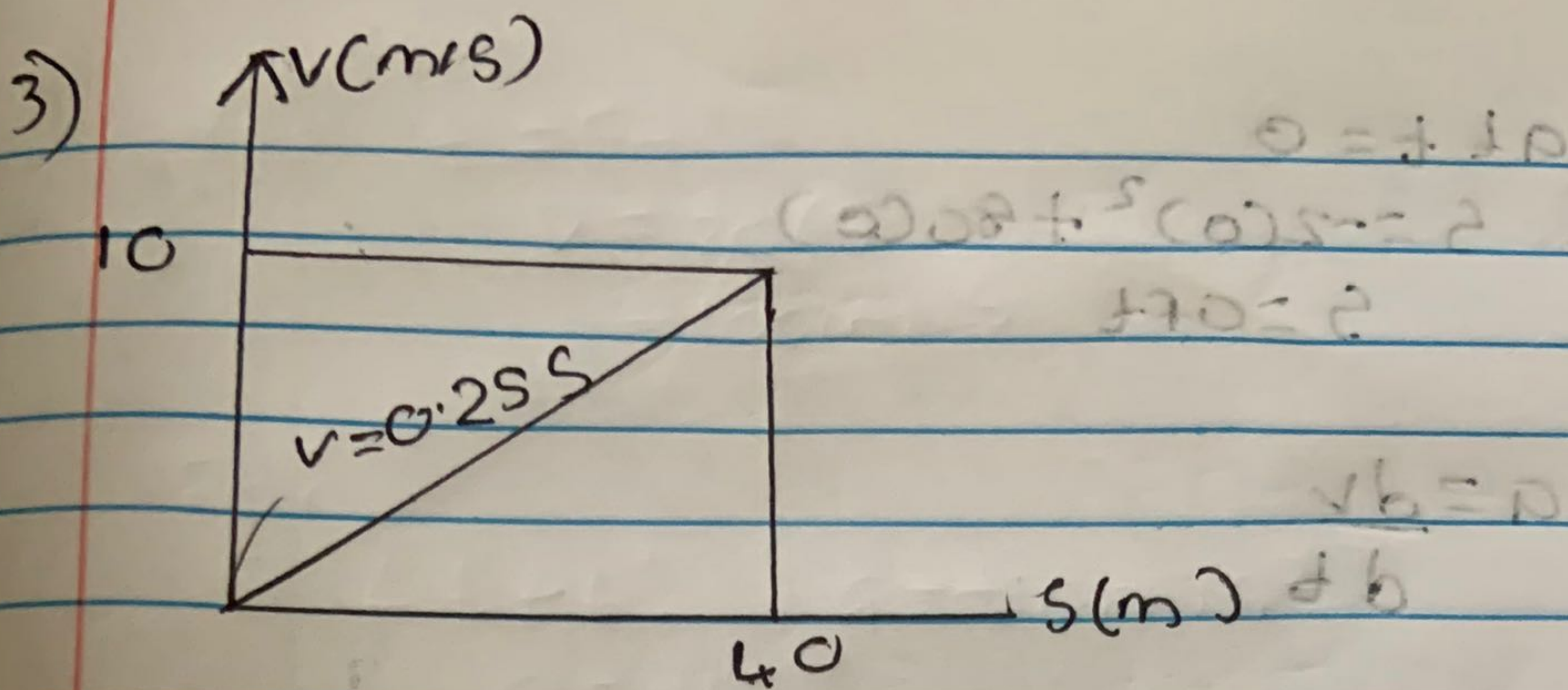
$$0 = 2 \text{ m/s}$$

$$A + 2 = 0$$

Question 2

Graph of $s(t)$ against $t(s)$





$$q ds = v dv$$

$$q = v \frac{dv}{ds}$$

$$ds$$

$$0 \leq s \leq 40 \text{ m}; \quad v = 0.25s$$

$$q = 0.25s \frac{d(0.25s)}{ds}$$

$$q = 0.25s \times 0.25$$

$$q = 0.0625s \text{ (m/s}^2\text{)}$$

$$\therefore \text{At } s = 40 \text{ m}$$

$$q = 0.0625 \times 40$$

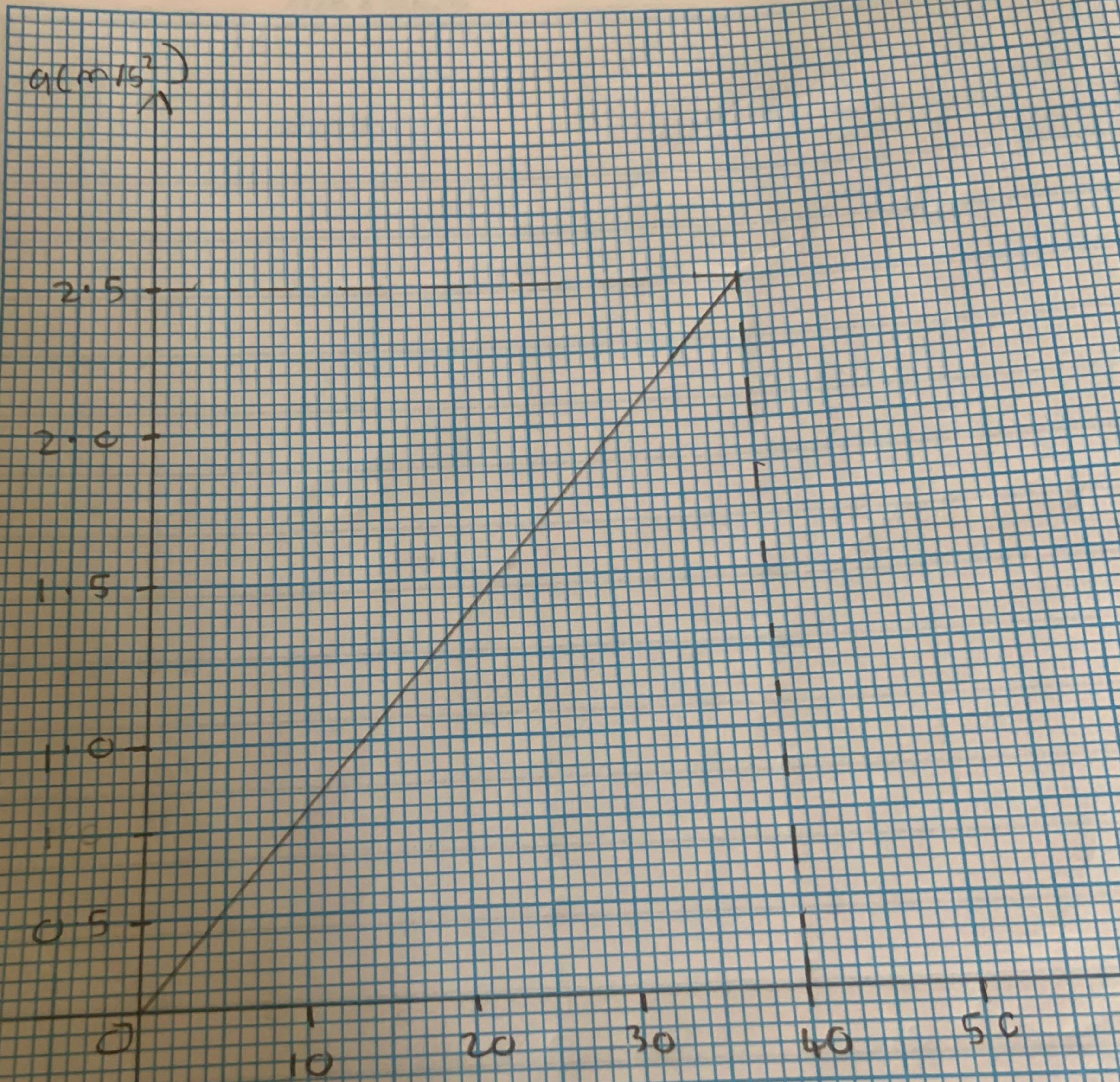
$$q = 2.5 \text{ m/s}^2$$

$$\text{At } s = 0$$

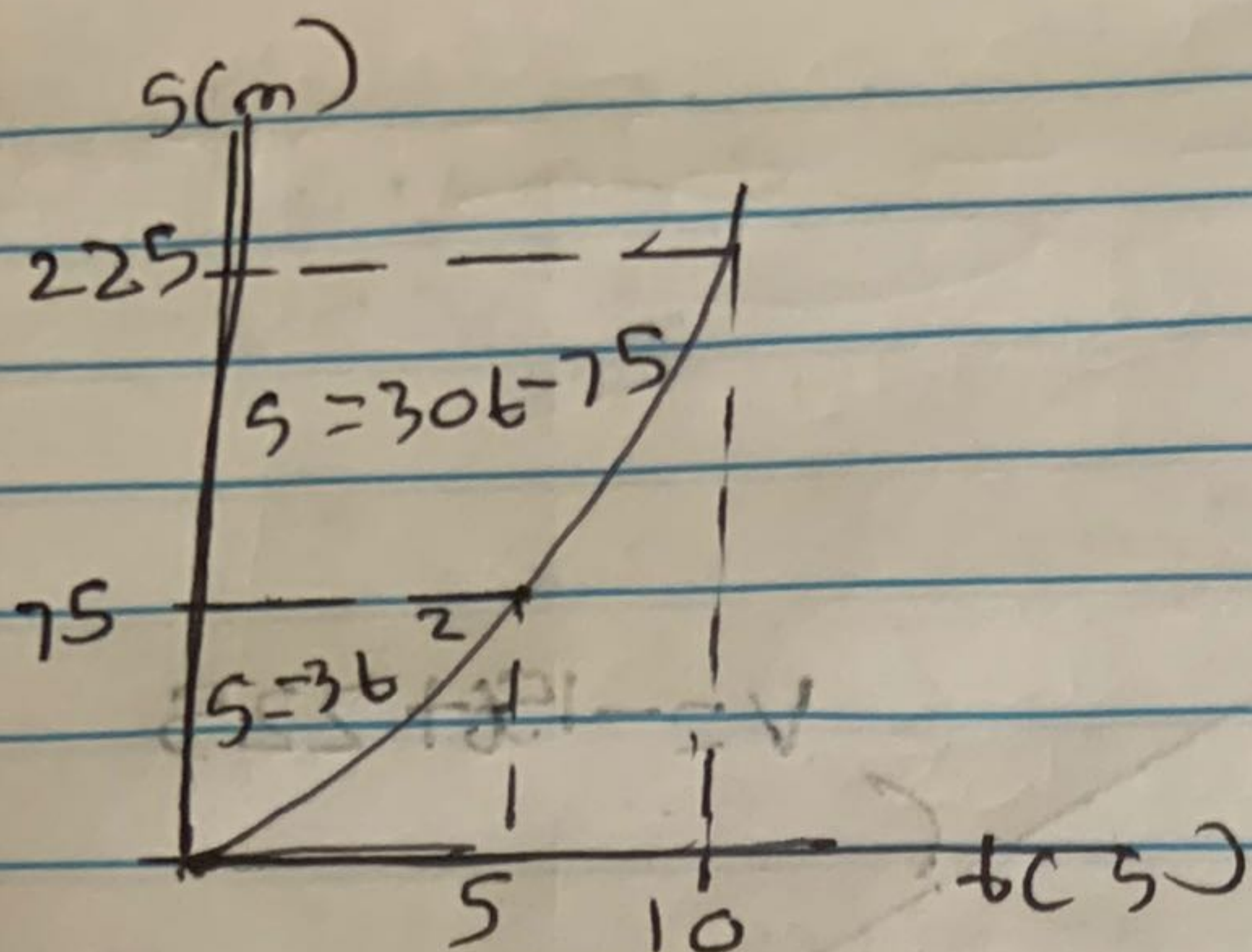
$$q = 0 \text{ m/s}^2$$

Question 3

Graph of $a(\text{m/s}^2)$ against



4)



$$v = \frac{ds}{dt} = \frac{225 - 75}{10 - 5}$$

$$v = 30 \text{ m/s}$$

$$s = 3t^2$$

$$v = \frac{ds}{dt}$$

$$v = \frac{ds}{dt} = 6t$$

$$s = 3t^2$$

$$0 \leq t < 5 \text{ s}, s = 3t^2$$

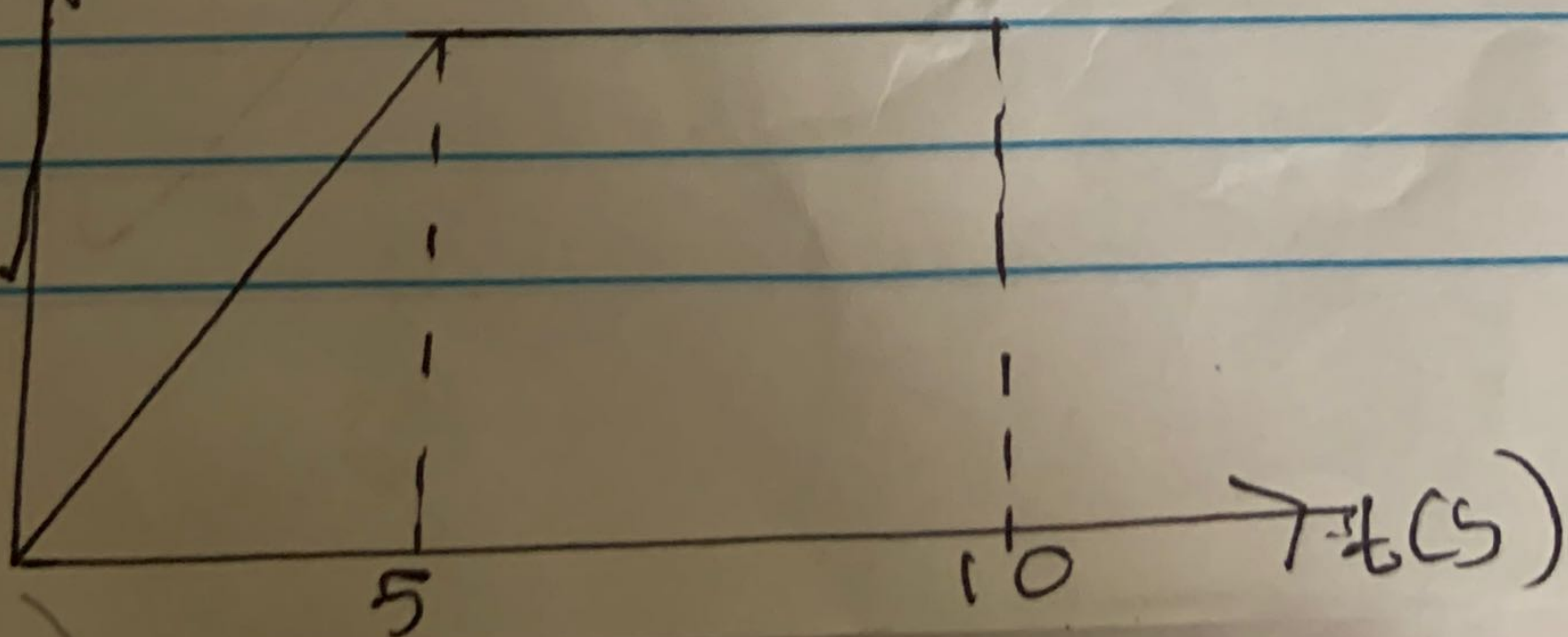
$$\therefore v = \frac{ds}{dt} = 6t \text{ m/s}$$

$$5 \text{ s} < t \leq 10, s = 30t - 75$$

$$v = \frac{ds}{dt} = 30 \text{ m/s}$$

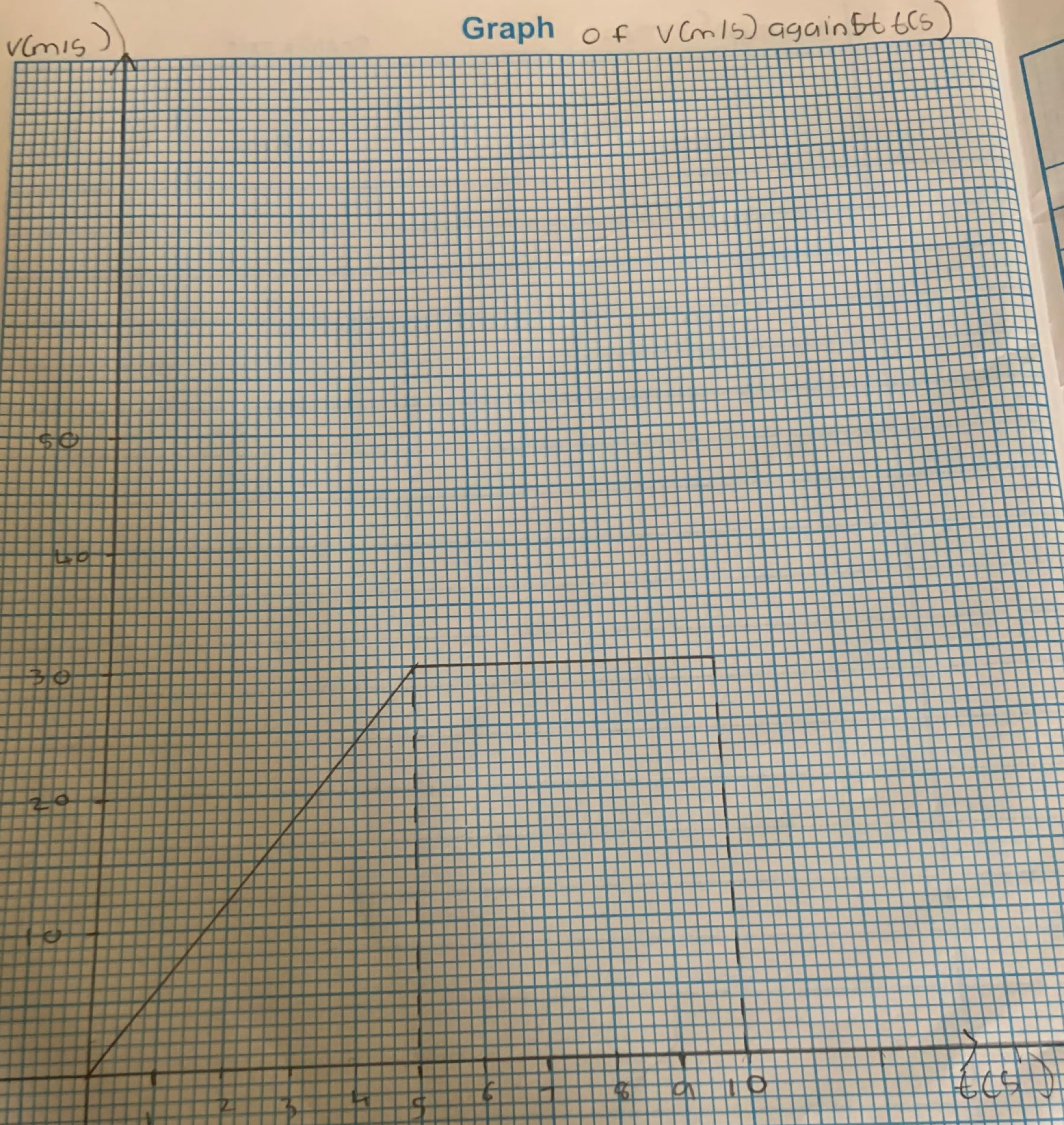
v(m/s)

30



Question 4

Graph of $v(m/s)$ against $t(s)$



$$0 \leq t < 5, v = 6t \text{ (m/s)}$$

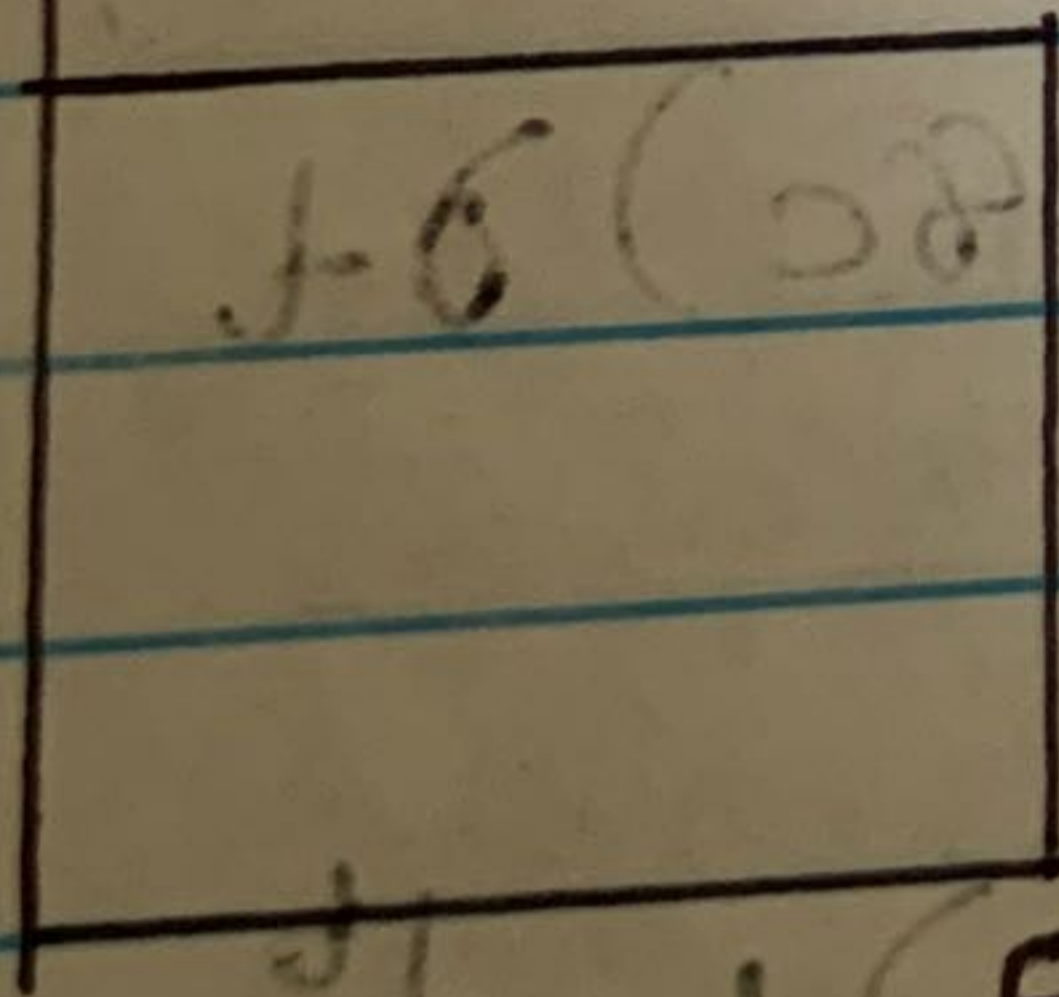
$$a = \frac{dv}{dt} = 6 \text{ m/s}^2$$

$$5 \leq t < 10, v = 30 \text{ (m/s)}$$

$$a = \frac{dv}{dt} = 0$$

$a \text{ (m/s)}^2$

6



$t \text{ (s)}$

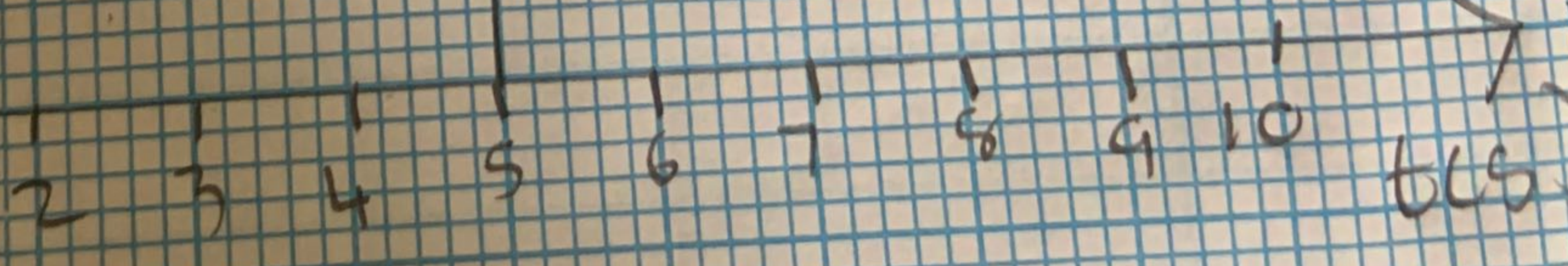
$$2 - 20 = -5t + 20$$

$$-20 = -2$$

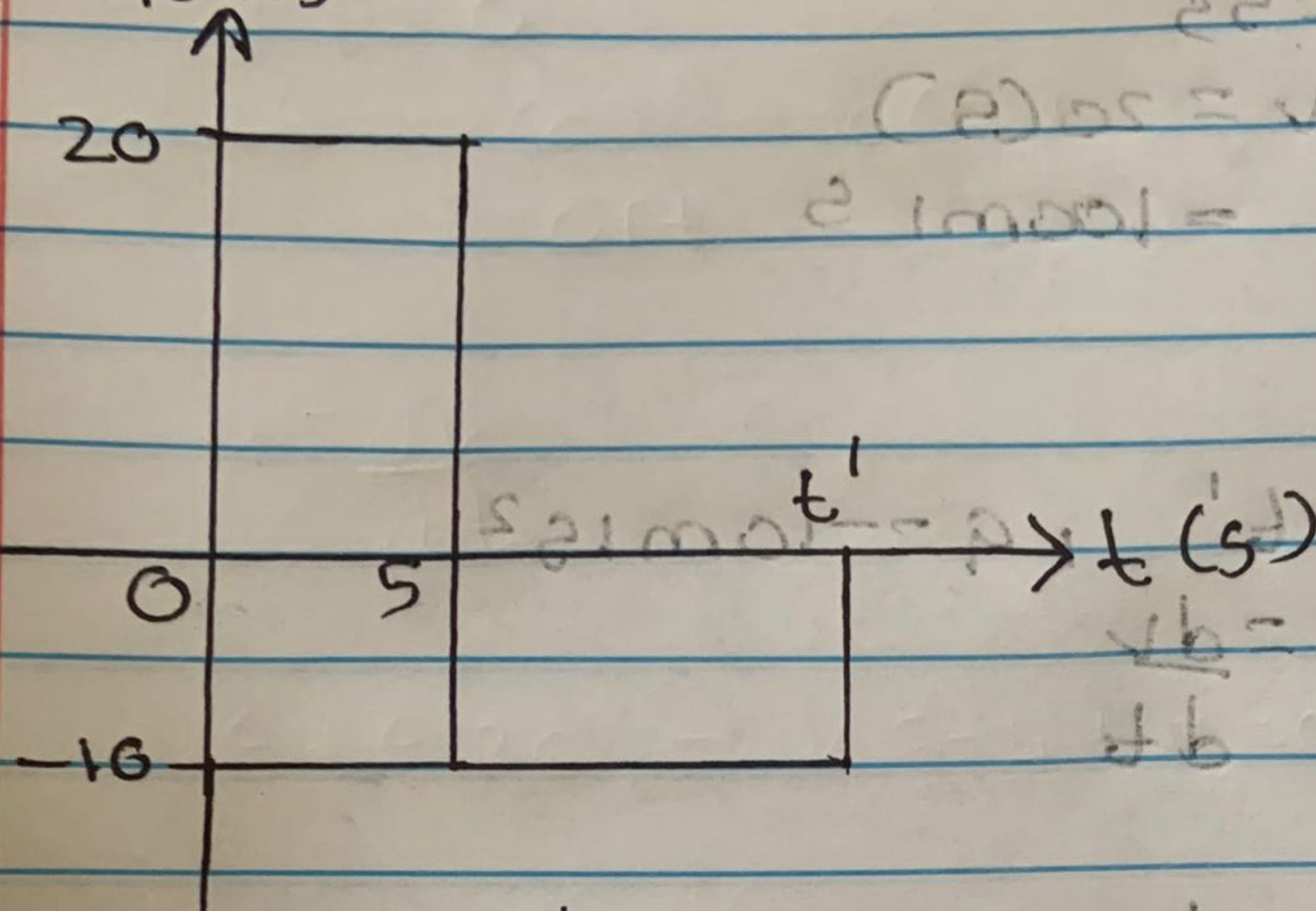
on 4

Graph of a (m/s^2) against t (s)

a (m/s^2)



5) $a(\text{m/s}^2)$



$$a = \frac{dv}{dt}$$

$$dv = a dt$$

$$\int_0^v dv = \int_0^t a dt$$

For $0 \leq t < 5$ s, $a = 20$

$$0 \leq t < 5 \text{ s, } a = 20$$

$$dv = a dt$$

$$\int_0^v dv = \int_0^t a dt$$

$$v = \int_0^t 20 dt$$

$$v = 20t \text{ m/s}$$

$$\text{At } t = 5s$$

$$v = 20 \text{ (S)}$$

$$= 100 \text{ m/s}$$

For

$$5s \leq t \leq t' \quad a = -10 \text{ m/s}^2$$

$$a = \frac{dv}{dt}$$

$$dv = a dt$$

$$\int_{100}^v dv = \int_{5s}^{t'} a dt$$

$$v - 100 = \int_5^{t'} -10 dt$$

$$v = [-10t \text{ m/s}]_5^{t'} + 100$$

$$v = -10t - (-10(5)) + 100$$

$$v = -10t - (-50) + 100$$

$$v = (-10t + 150) \text{ m/s}$$

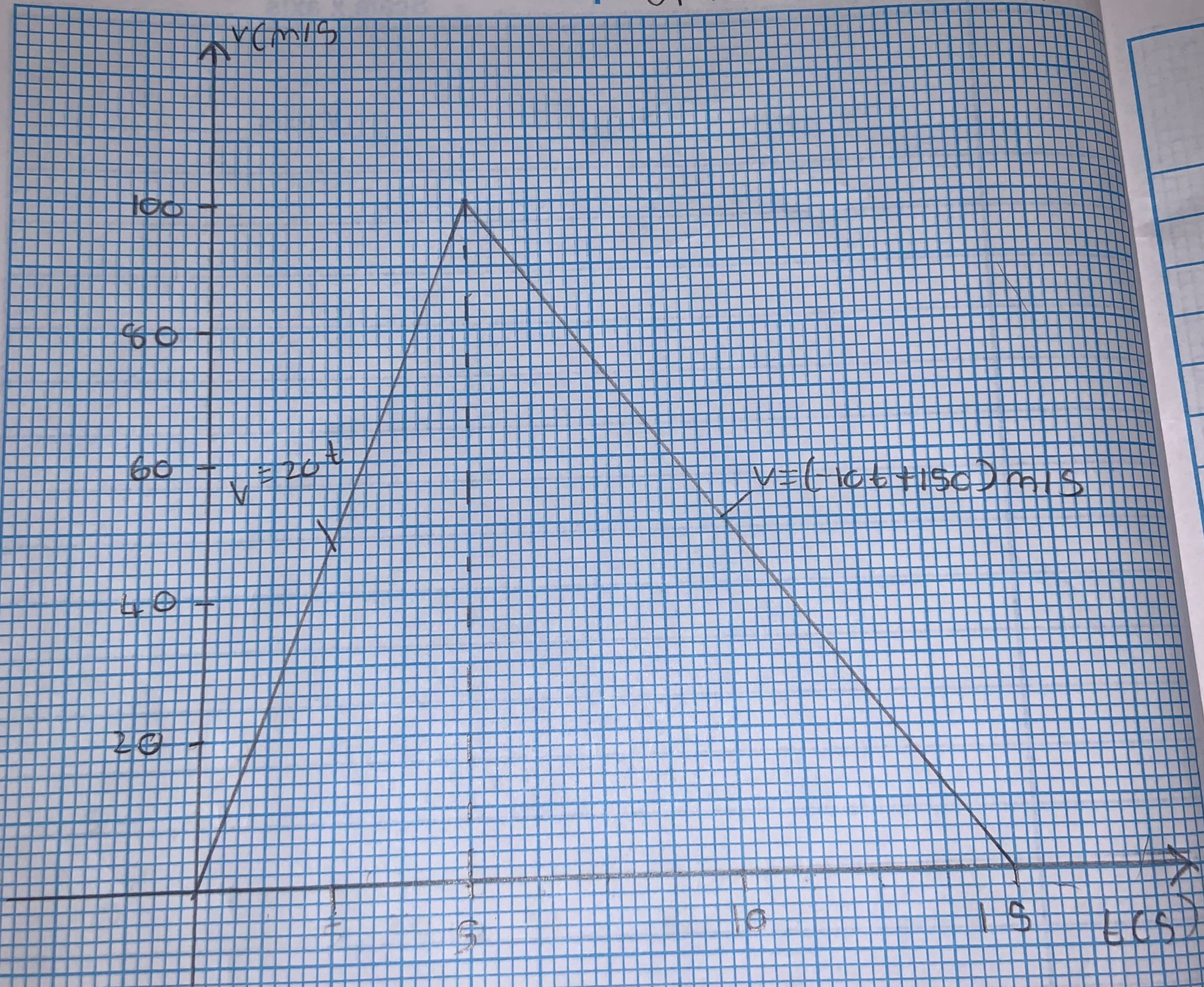
$$0 = -10t' + 150$$

$$10t' = 150$$

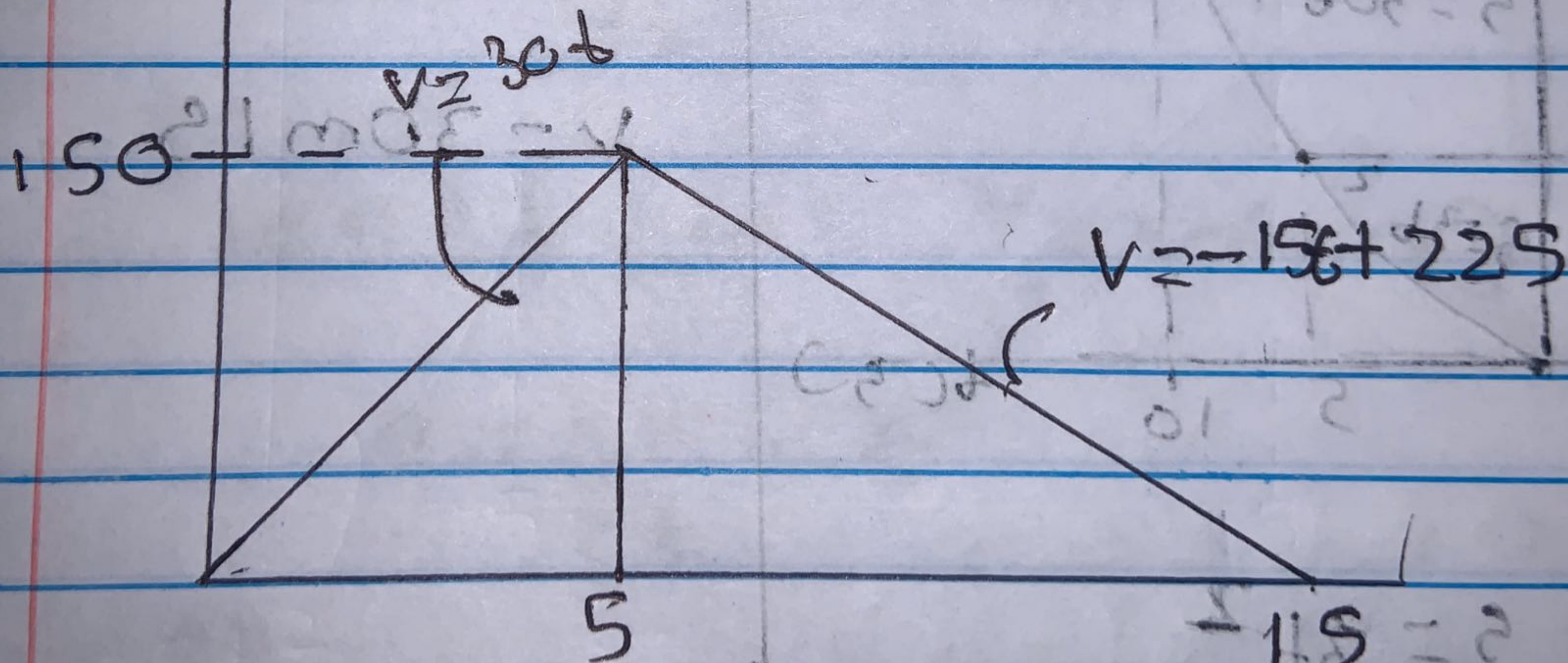
$$t' = 15s$$

Question 5

Graph of v (m/s) against t (s)



6) v (m/s)



$$0 \leq t \leq 5 \text{ s}$$

$$v = 30t$$

$$\int_0^s ds = \int_0^t 30t \, dt$$

$$s = (15t^2) \text{ m}$$

when $t = 5 \text{ s}$

$$s = 15(5)^2 = 375 \text{ m}$$

$$55 \leq t \leq 15 \text{ s}$$

$$v = (-15t + 225) \text{ m/s}$$

$$\int_{375 \text{ m}}^s ds = \int_{55}^t (-15t + 225) dt$$

$$s = (-7.5t^2 + 225t - 562.5) \text{ m}$$

$$s = 1125 \text{ m}$$

Question 6

Graph of $s(m)$ against $t(s)$

