

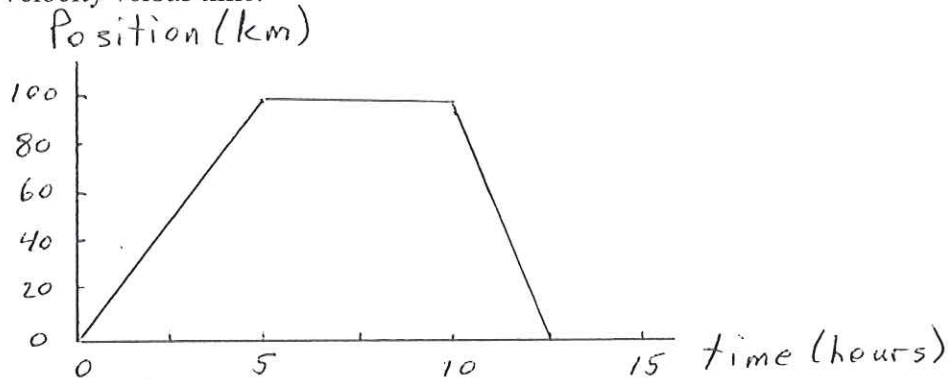
## Quiz 2

Name: \_\_\_\_\_ Student Number: \_\_\_\_\_

**CALCULATORS ALLOWED.**

**10 MARKS**

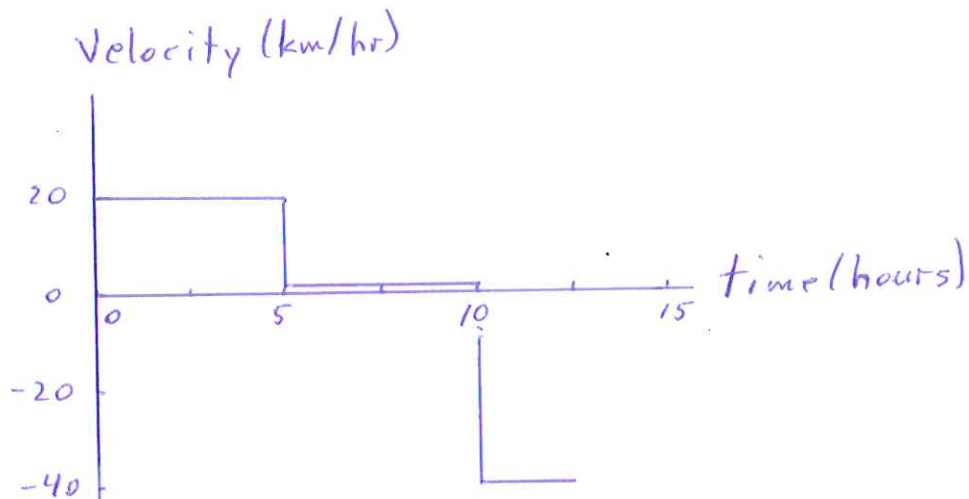
1. (4 marks) The position of a car is given by the following graph. Plot a graph of the car's velocity versus time.



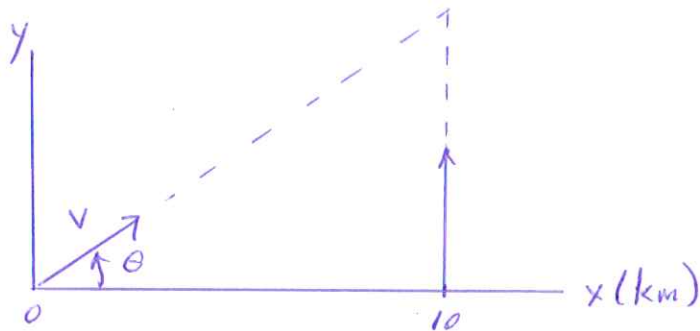
Slope from  $t=0 \rightarrow 5$  hrs is  $v = \frac{100 \text{ km} - 0}{5 \text{ hr} - 0} = 20 \frac{\text{km}}{\text{hr}}$

" "  $t=5 \rightarrow 10$  is  $v=0$

" "  $t=10 \rightarrow 12.5$  is  $v = \frac{0 - 100}{2.5} = -40 \frac{\text{km}}{\text{hr}}$



2. (6 marks) A terrorist launches a rocket which travels at a constant velocity 5 m/sec upwards. A missile is launched from a position 10 km away which has constant velocity 10 m/sec to intercept the rocket
- Assuming the Earth is flat, at what angle should the missile be aimed to hit the terrorist rocket as soon as possible?
  - At what altitude does the missile hit the rocket?
  - At what time does the missile hit the rocket?



Rocket Position  $(x_R, y_R) = (10, 5t)$

Missile Position  $(x_M, y_M) = (10 \cos \theta t, 10 \sin \theta t)$

$$(x_R, y_R) = (x_M, y_M) \Rightarrow 10,000 = 10t \cos \theta \quad (1)$$

$$5t = 10t \sin \theta$$

$$\sin \theta = \frac{1}{2}$$

$$\theta = 30^\circ$$

$$\text{Subst } \theta \text{ in (1)} \Rightarrow 10,000 = 10t \cos 30^\circ \Rightarrow t = 1155 \text{ sec.}$$

$$\therefore \text{height of intercept is } 5 \times 1155 = 5.77 \text{ km.}$$