

Quiz 1

Name: _____ Student Number: _____

1. (4 marks) An astronomer observes an asteroid and spaceship separated by 5000 km that are on a path that will result in a collision. The spacecraft is approaching the asteroid at a speed of 10 km/sec. The spaceship is 2×10^8 km away from the Earth. If the astronomer immediately sends a message to the space ship to change course, when does the message arrive before/after the collision?

Time to send message to spacecraft

$$= \frac{2 \times 10^8 \text{ km}}{3 \times 10^5 \text{ km/sec}}$$

↖ speed of light

$$= 667 \text{ sec.}$$

Distance travelled by spacecraft toward asteroid

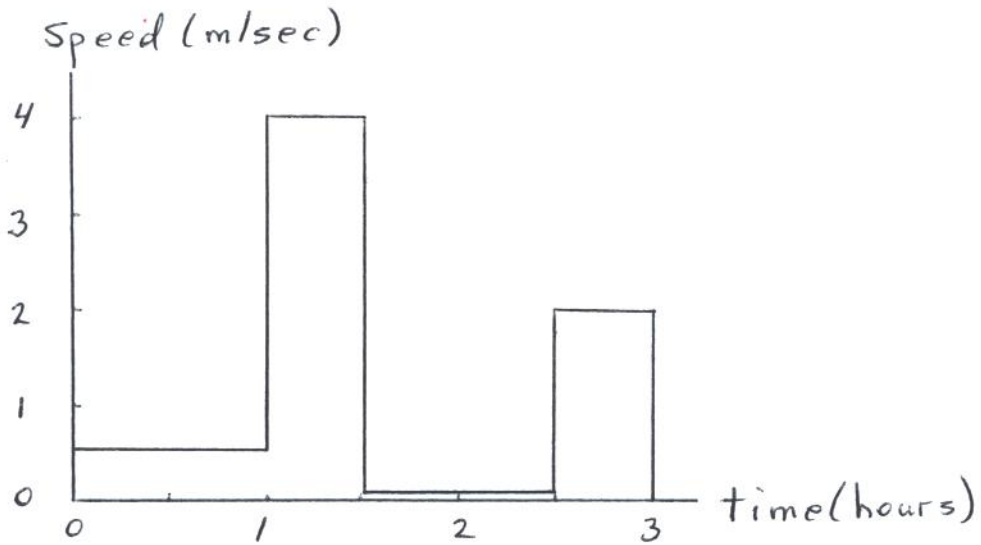
$$= 10 \frac{\text{km}}{\text{sec}} \times 667 \text{ sec}$$

$$= 6,670 \text{ km.}$$

$$> 5,000 \text{ km}$$

∴ collision occurs before message arrives,

2. (6 marks) The speed of a car as a function of time is shown below.



- a) What is the total distance traveled in 3 hours?
 b) What is the average speed during the 3 hours?

Interval (hr)	Interval (sec)	Distance travelled
0 → 1	3600	$\frac{0.5 \text{ m}}{\text{sec}} \times 3600 \text{ sec} = 1800 \text{ m}$
1 → 1.5	1800	$4 \times 1800 = 7200$
1.5 → 2.5	3600	0
2.5 → 3	1800	$2 \times 1800 = 3600$
Total Distance		12,600 m

$$\begin{aligned}
 \text{Ave. Speed} &= \frac{\text{total distance}}{\text{total time}} \\
 &= \frac{12,600 \text{ m}}{3 \text{ hr} \times 3600 \text{ sec/hr}} \\
 &= 1.17 \text{ m/sec}
 \end{aligned}$$

Total = 10 marks