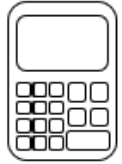


# Speed-Time Graphs (Curves)



Here is a speed – time graph for a car.

It shows the first 16 seconds of its journey.

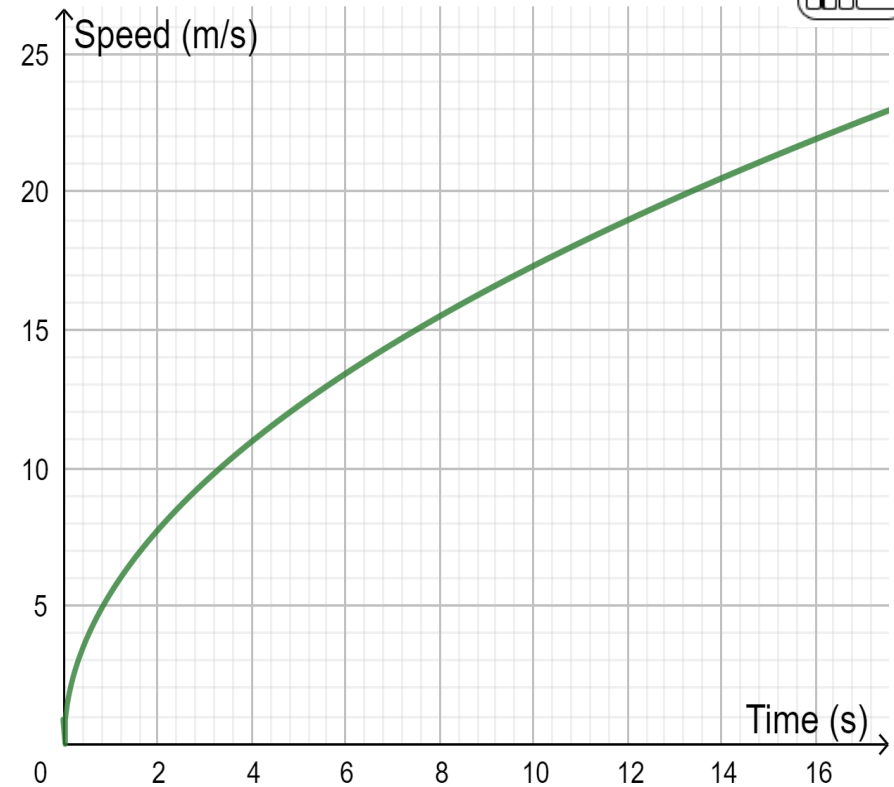
(a) Work out the average acceleration of the car between 4 and 12 seconds.

(b) Work out an estimate of the acceleration of the car at 2 seconds.

(c) By using 4 strips of equal width, work out an estimate for the distance travelled over the first 16 seconds of the journey.

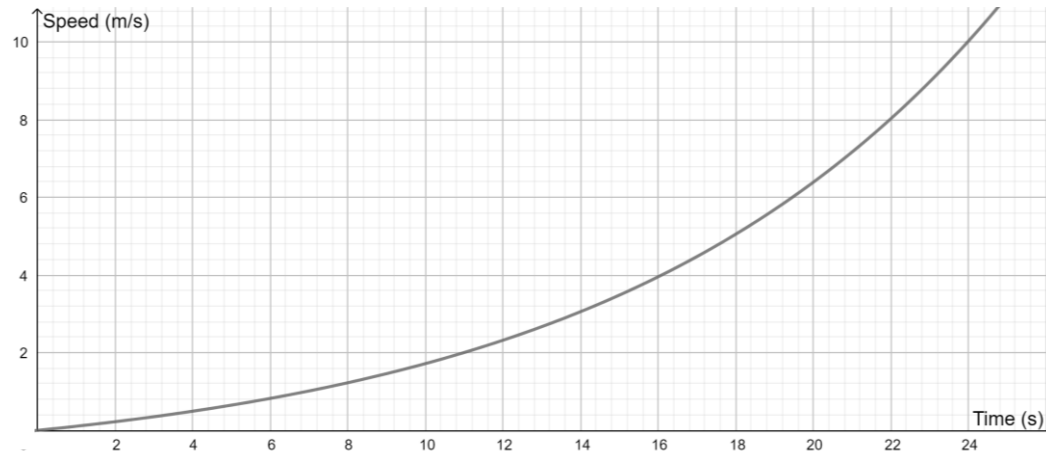
(d) Is your answer to (c) an overestimate or an underestimate of the actual distance travelled? Explain your answer.

(e) Work out the average speed of the car over the first 16 seconds of the journey.



## R 4.5 Speed-Time Graphs (Curves)

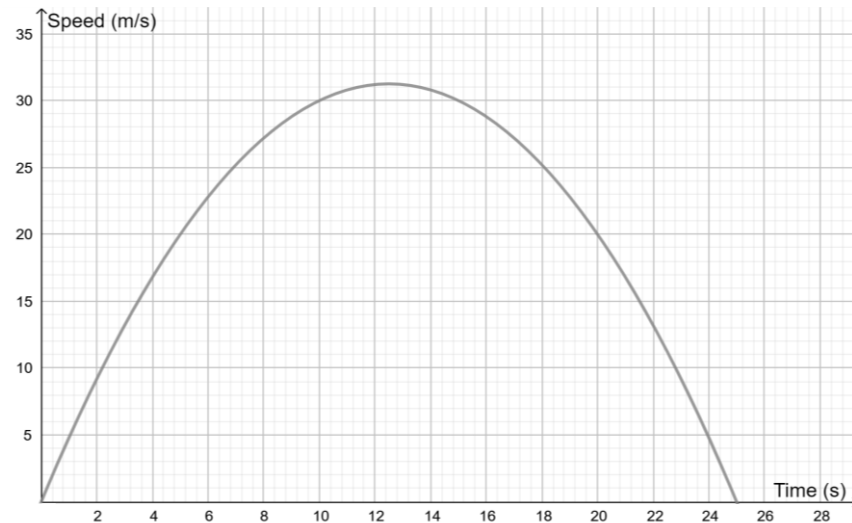
I'm giving it a try!



Here is a speed – time graph for a bus.  
It shows the first 24 seconds of its journey.

(a) Work out the average acceleration of the bus between 0 and 10 seconds.

(b) Work out the average acceleration of the bus between 16 and 24 seconds.



Here is a speed – time graph for a car.  
It shows the first 25 seconds of its journey.

(a) Work out the average acceleration of the car between 0 and 10 seconds.

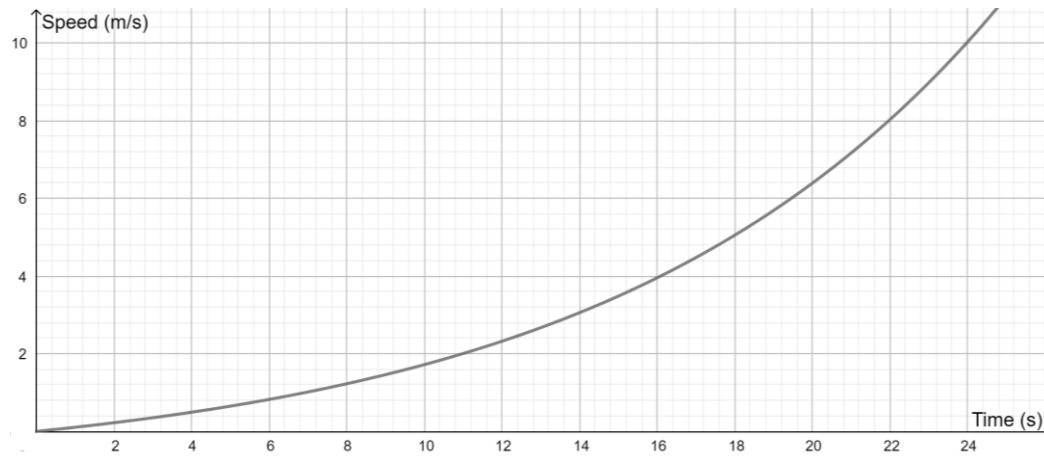
(b) Work out the average acceleration of the car between 18 and 24 seconds.

My Reflections...



## R 4.5 Speed-Time Graphs (Curves)

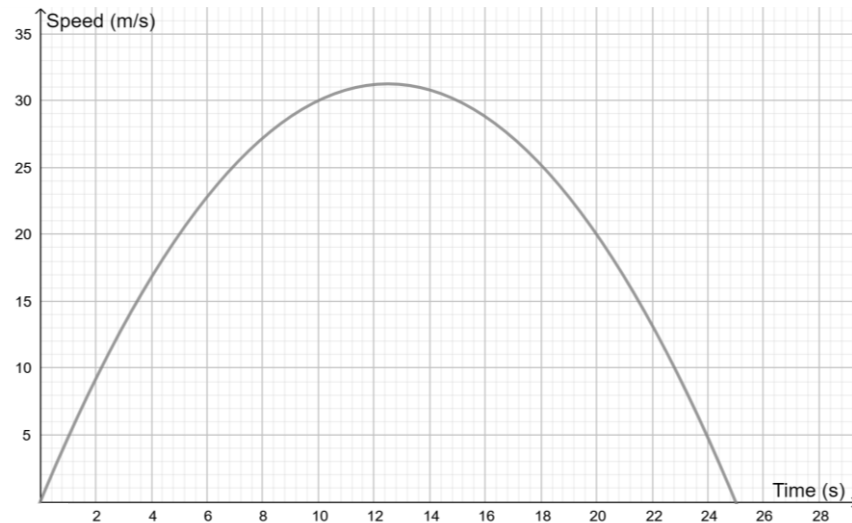
I'm building my confidence!



Here is a speed – time graph for a bus.  
It shows the first 24 seconds of its journey.

(a) Work out an estimate of the acceleration of the bus at 10 seconds.

(b) Work out an estimate of the acceleration of the bus at 20 seconds.



Here is a speed – time graph for a car.  
It shows the first 25 seconds of its journey.

(a) Work out an estimate of the acceleration of the car at 6 seconds.

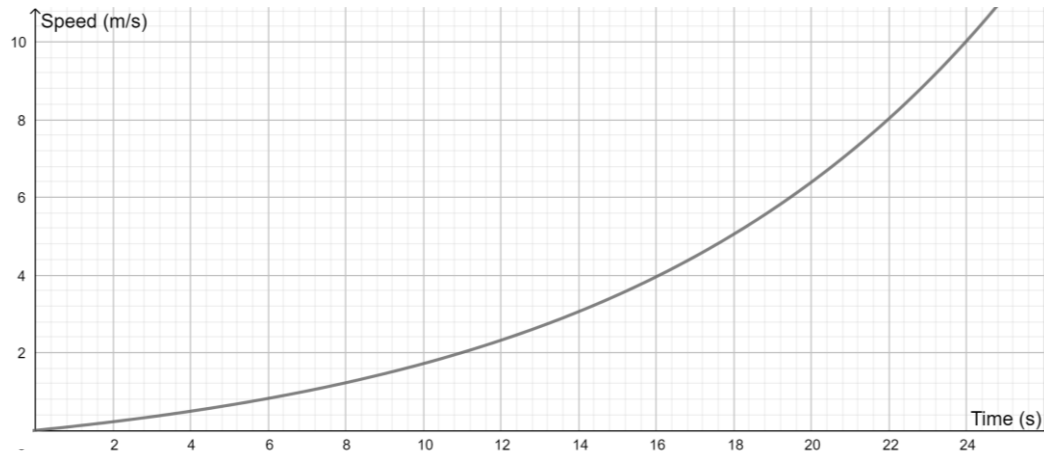
(b) Work out an estimate of the acceleration of the car at 20 seconds.

My Reflections...



## R 4.5 Speed-Time Graphs (Curves)

I'm ready for anything!



Here is a speed – time graph for a bus.

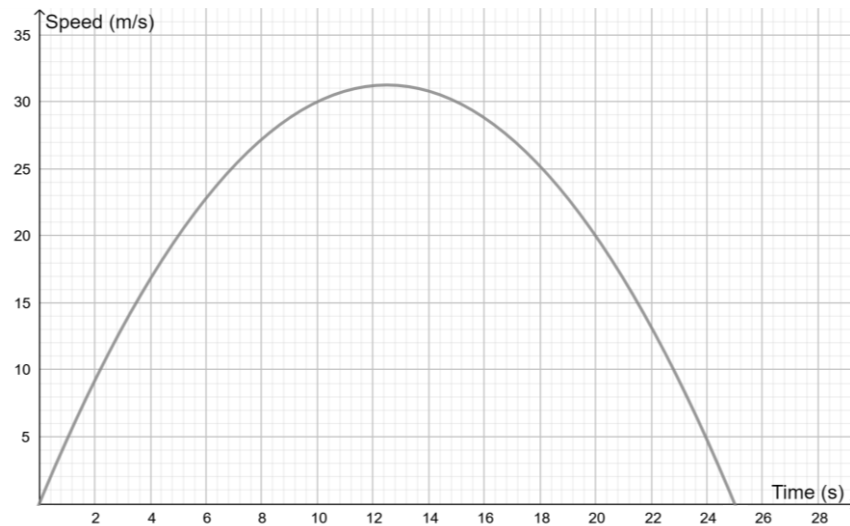
It shows the first 24 seconds of its journey.

(a) By using 1 strip, work out an estimate for the distance travelled over the first 8 seconds of the journey.

(b) By using 3 strips of equal width, work out an estimate for the distance travelled over the first 24 seconds of the journey.

(c) Is your answer to (b) an overestimate or an underestimate of the actual distance travelled? Explain your answer.

(d) Work out the average speed of the bus over the first 24 seconds of the journey.



Here is a speed – time graph for a car.

It shows the first 25 seconds of its journey.

(a) By using 1 strip, work out an estimate for the distance travelled over the first 5 seconds of the journey.

(b) By using 5 strips of equal width, work out an estimate for the distance travelled over the first 25 seconds of the journey.

(c) Is your answer to (b) an overestimate or an underestimate of the actual distance travelled? Explain your answer.

(d) Work out the average speed of the car over the first 25 seconds of the journey.

My Reflections...

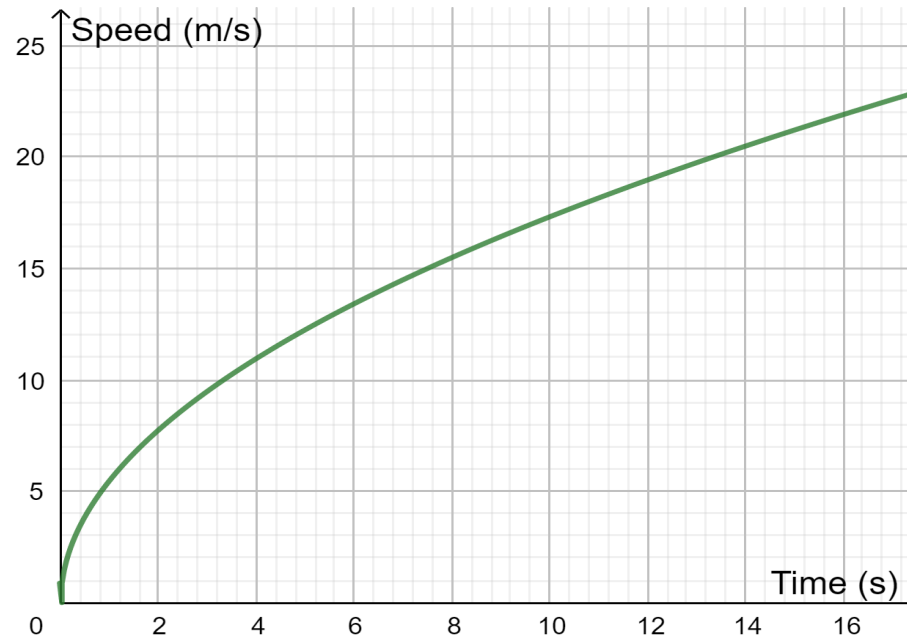


### Extension

Here is a speed-time graph for a car.  
It shows the first 16 seconds of its journey.

Calculate the average acceleration of the car over the first 16 seconds of its journey.

Can you find a time at which the cars instantaneous acceleration is equal to its average acceleration?



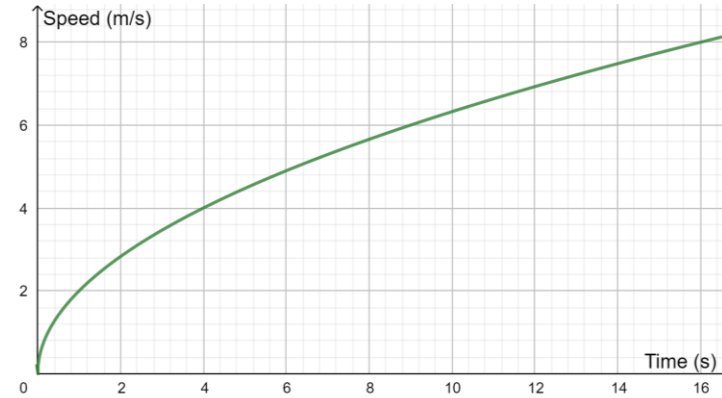
## R 4.5 Speed-Time Graphs (Curves)

### Homework

#### Retrieval Homework

- 1) Solve  $x^2 + 3x - 18 = 0$
- 2) A bag is reduced by 15% to £41. How much did it cost originally?
- 3) Write 0.206206... as a fraction.
- 4) Simplify  $\sqrt{300}$
- 5) Calculate the  $n^{\text{th}}$  term of the sequence  
9, 18, 31, 48, 69

#### Topic Homework



Here is a speed – time graph for a bike.

It shows the first 16 seconds of its journey.

- (a) Work out the average acceleration of the bike between 4 and 13 seconds.
- (b) Work out an estimate of the acceleration of the bike at 4 seconds.
- (c) By using 4 strips of equal width, work out an estimate for the distance travelled over the first 16 seconds of the journey.
- (d) Is your answer to (c) an overestimate or an underestimate of the actual distance travelled? Explain your answer.
- (e) Work out the average speed of the bike over the first 16 seconds of the journey.

My Reflections...



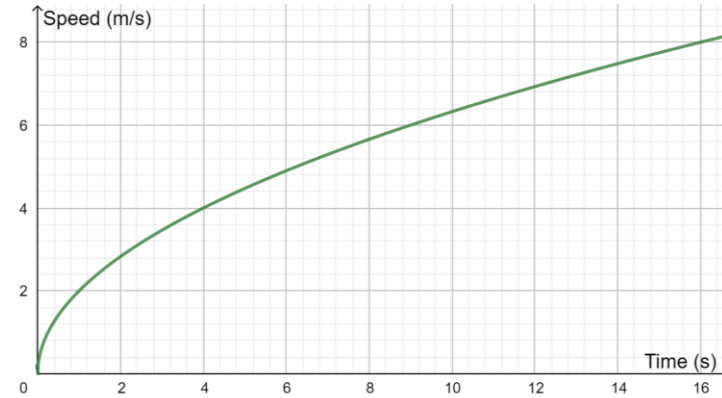
## R 4.5 Speed-Time Graphs (Curves)

### Homework

#### Retrieval Homework

- 1) Solve  $x^2 + 3x - 18 = 0$
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- 5) Calculate the  $n^{\text{th}}$  term of the sequence  
9, 18, 31, 48, 69

#### Topic Homework



Here is a speed – time graph for a bike.

It shows the first 16 seconds of its journey.

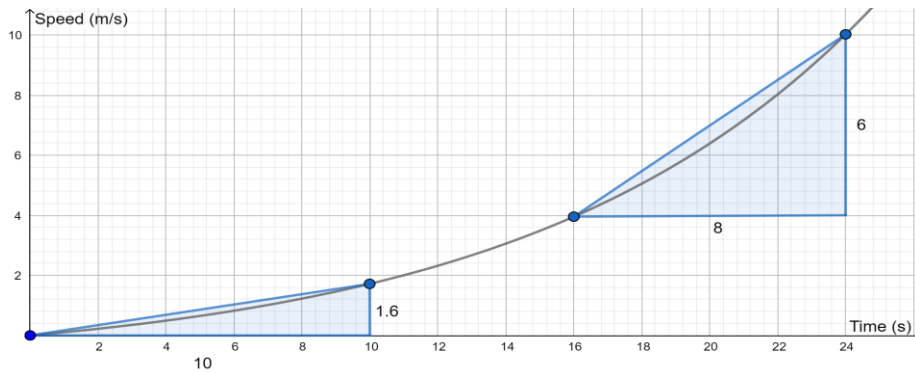
- (a) Work out the average acceleration of the bike between 4 and 13 seconds.
- (b) Work out an estimate of the acceleration of the bike at 4 seconds.
- (c) By using 4 strips of equal width, work out an estimate for the distance travelled over the first 16 seconds of the journey.
- (d) Is your answer to (c) an overestimate or an underestimate of the actual distance travelled? Explain your answer.
- (e) Work out the average speed of the bike over the first 16 seconds of the journey.

My Reflections...



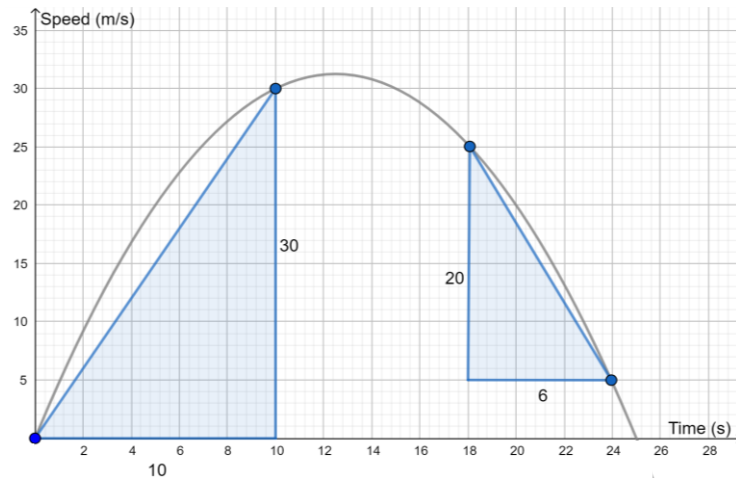
# R 4.5 Speed-Time Graphs (Curves)

I'm giving it a try!



(a)  $1.6 \div 10 = 0.16 \text{ m/s}^2$

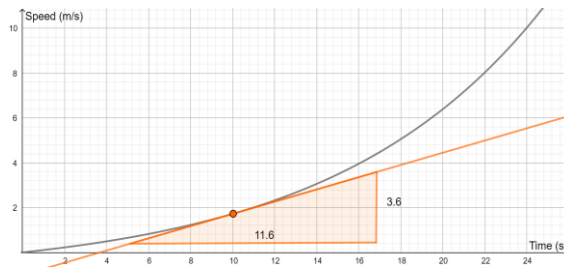
(b)  $6 \div 8 = 0.75 \text{ m/s}^2$



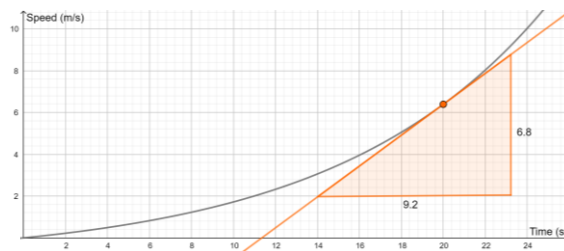
(a)  $30 \div 10 = 3 \text{ m/s}^2$

(b)  $-20 \div 6 = -3.3 \text{ m/s}^2$  (=  $3.3 \text{ m/s}^2$  deceleration)

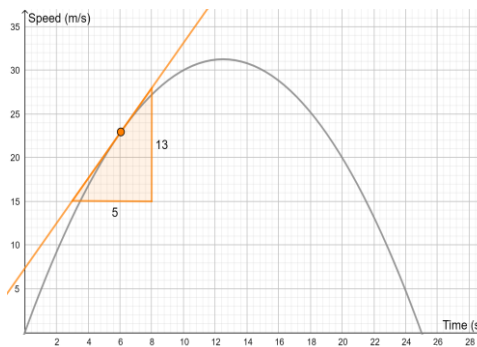
I'm building my confidence!



(a)  $3.6 \div 11.6 = 0.31 \text{ m/s}^2$  (2dp)

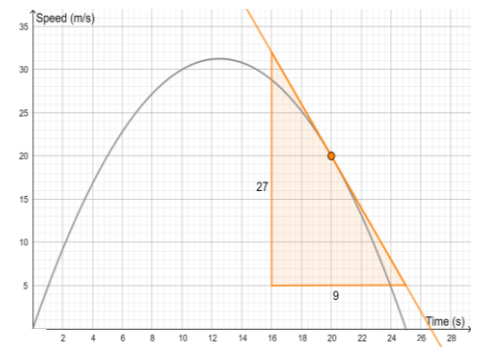


(b)  $6.8 \div 9.2 = 0.74 \text{ m/s}^2$  (2dp)



(a)  $13 \div 5 = 2.6 \text{ m/s}^2$

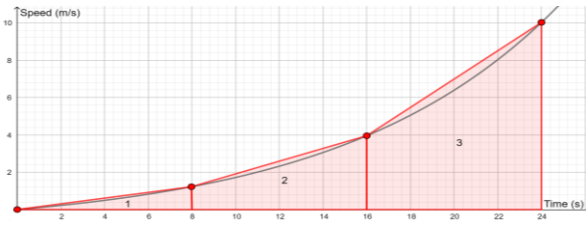
(b)  $-27 \div 9 = -3 \text{ m/s}^2$  (=  $3 \text{ m/s}^2$  deceleration)





# R 4.5 Speed-Time Graphs (Curves)

I'm ready for anything!



(a)  $(1.2 \times 8) \div 2 = 4.8\text{m}$

(b)  $\frac{(1.2+4)}{2} \times 8 = 20.8\text{m}$   $\frac{(4+10)}{2} \times 8 = 56\text{m}$

Total distance =  $4.8 + 20.8 + 56 = 81.6\text{m}$

(c) Overestimate as the straight lines I have drawn lie above the curve increasing the area I am calculating.

(d)  $81.6 \div 24 = 3.4\text{m/s}$



(a)  $(20 \times 5) \div 2 = 50\text{m}$

(b)  $\frac{(20+30)}{2} \times 5 = 125\text{m}$   $30 \times 5 = 150\text{m}$   $\frac{(30+20)}{2} \times 5 = 125\text{m}$   $(20 \times 5) \div 2 = 50\text{m}$

Total distance =  $50 + 125 + 150 + 125 + 50 = 500\text{m}$

(c) Underestimate as the straight lines I have drawn lie below the curve decreasing the area I am calculating.

(d)  $500 \div 25 = 20\text{m/s}$

Extension



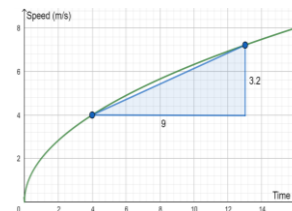
The average acceleration over the first 16 seconds is equal to the instantaneous acceleration at approximately 4 seconds. This is where the chord and tangent are approximately parallel, so the gradients are equal.

Homework

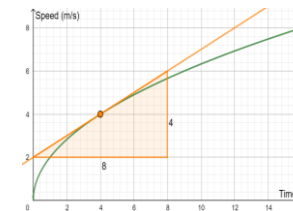
Retrieval Homework

- (1)  $x = 3, x = -6$  (2) £48.24 (3)  $\frac{206}{999}$  (4)  $10\sqrt{3}$  (5)  $2n^2 + 3n + 4$

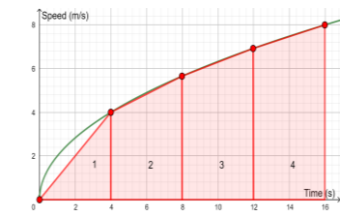
Topic Homework



(a)  $3.2 \div 9 = 0.35\text{m/s}^2$



(b)  $4 \div 8 = 0.5\text{m/s}^2$



(c)  $8 + 19.2 + 25 + 29.8 = 82\text{m}$

(d) Underestimate as the straight lines I have drawn in (c) lie below the curve decreasing the area I am calculating.

(e)  $82 \div 16 = 5.125\text{m/s}$