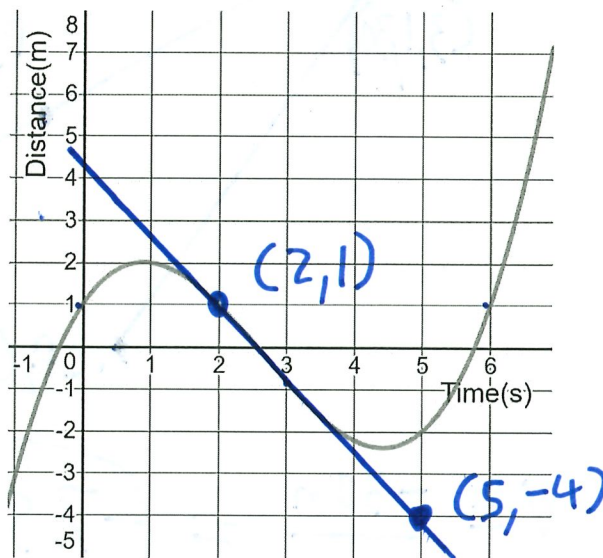


### Instantaneous Velocity

Suppose it is necessary to determine the velocity of an object at one instant in time. In this case an average will not do because an average involves a time interval,  $\Delta t$ . In order to obtain an instantaneous velocity the concept of a tangent to a curve is required.



1. What is the average velocity between  $t=0$  and  $t=6$ ?

$$\bar{v} = 0 \text{ m/s}$$

2. What is the average velocity between  $t=1$  and  $t=5$ ?

$$\frac{-4 \text{ m}}{4 \text{ sec}} = -1 \text{ m/s}$$

3. What is the average velocity between  $t=2$  and  $t=4$ ?

$$\frac{-3.2 \text{ m}}{2 \text{ sec}} = -1.6 \text{ m/s}$$

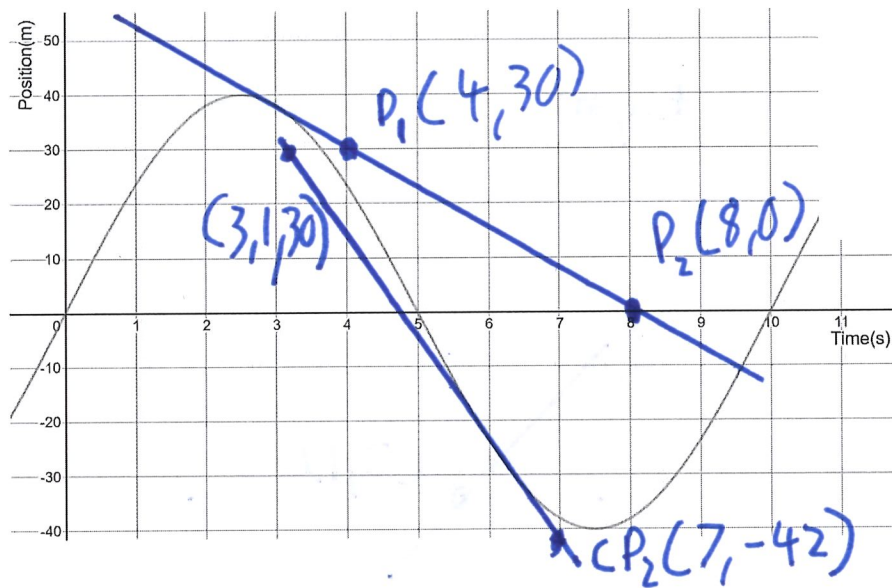
4. What is the instantaneous velocity at  $t=3$ ?

$$v = \frac{\Delta x}{\Delta t} = \frac{-5 \text{ m}}{3 \text{ sec}} = -1.7 \text{ m/s}$$

5. What is the instantaneous velocity at  $t=1$ ?

$$v = 0$$

Practice



1. Determine the instantaneous velocity at  $t=3$ .

$$V = \frac{-30\text{m}}{4\text{sec}} = -7.5\text{m/s}$$

2. Determine the instantaneous velocity at  $t=6$ .

$$V = \frac{-42 - 30}{7 - 3.1} = -18\text{m/s}$$

3. Determine the instantaneous velocity at  $t=2.5$  and  $7.5$ .

0