Displacement, Velocity and Acceleration Exercises

In the following questions, assume that the standard units for time t (seconds (s)), displacement x (metres(m)), velocity (ms^{-1}) and acceleration (ms^{-2}).

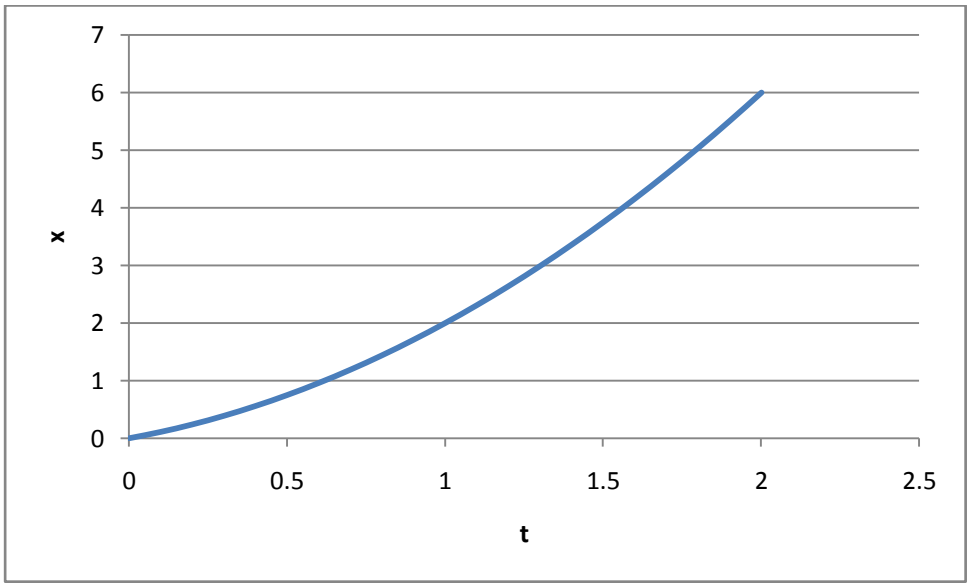
1. An object's displacement is given by the expression

$$x(t) = 3\sin(2t)$$

(Note that the unit of the sine function is radians.)

State an expression for the velocity and state the velocity at $t = 1$s.

2. An object's displacement is given by the following graph.



Determine the velocity at $t = 1$s.

3. An object's velocity (in ms^{-2}) is given by the formula $x(t) = 6t^2 + 4t$. Determine an expression for the object's displacement. State the displacement of the object after 10s.

4. An object's displacement is given by the formula:

$$x(t) = 2e^{3t}\sin(0.5t).$$

Determine expressions for the velocity $\dot{x}(t)$ and the acceleration $\ddot{x}(t)$.

State the displacement, velocity and acceleration of the object at $t = 2$s.

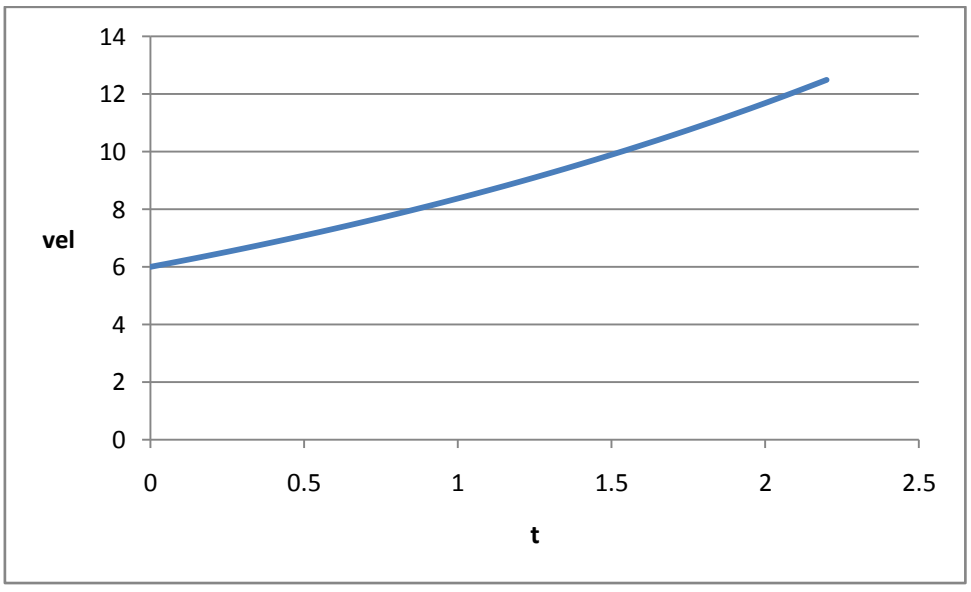
5. An object's acceleration is given by the formula:

$$\ddot{x}(t) = 0.4\cos\left(3t + \frac{\pi}{6}\right)$$

Determine expressions for the velocity and displacement.

State the acceleration, velocity and displacement after 0.2s.

6. The velocity of an object is shown in the following graph.



Estimate the average acceleration and the distance travelled after 2s.