

Planet Holloway **websheet 3.1**

Physics Chapter 3

You may print this out and write on it or work on your own paper.

Show all work.

1. A ball's position is described by the $x = 8t - 14t^2$. What is the ball's velocity at 4 seconds given it started at 8 m/s?
2. An object moves such that $x = 6t + 2t^2$. What is the object's acceleration at 3 seconds?
3. A car has a velocity given by $v = 2t^3$. What is its acceleration at 4 seconds assuming that it started from rest?
4. The position of an orangutan is given by $x = -34t + 0.4t^3$. If the orangutan starts with an initial position of 2 m, what is the velocity and acceleration at 5 seconds?
5. A car has a velocity given by $v = 14t^2 + 0.5t^3$. What is the acceleration of the car at 4 seconds?
6. The horizontal path of an object is described by $x = 4 + 12t - 9t^3$. What is the velocity and acceleration of the object at 7 seconds?

Answers:

1.

$$\begin{aligned}v &= \frac{dx}{dt} \\&= \frac{d}{dt}(8t - 14t^2) \\&= 8 - 2(14)t \\&= 8 - 28t \\&= 8 - 28(4) \\&= -104 \text{ m/s}\end{aligned}$$

$$\begin{aligned}6. \quad v &= 12 - 27t^2 \\v &= 12 - 27(7)^2 \\v &= -1311 \text{ m/s}\end{aligned}$$

$$\begin{aligned}a &= -54t \\a &= -54(7) \\a &= -378 \text{ m/s/s}\end{aligned}$$

2.

$$\begin{aligned}v &= \frac{dx}{dt} \\a &= \frac{dv}{dt} = \frac{d^2x}{dt^2} \\a &= \frac{d^2}{dt^2}(6t + 2t^2) \\a &= 4 \text{ m/s}^2\end{aligned}$$

3.

$$\begin{aligned}a &= \frac{dv}{dt} = \frac{d}{dt}(2t^3) \\a &= 6t^2 \\a &= 6(4)^2 \\a &= 96 \text{ m/s}^2\end{aligned}$$

4.

$$\begin{aligned}v &= -34 + 1.2t^2 \\v &= -34 + 1.2(5)^2 \\v &= -4 \text{ m/s} \\a &= 2.4t \\a &= 2.4(5) \\a &= 12 \text{ m/s}^2\end{aligned}$$

5.

$$\begin{aligned}a &= 28t + 1.5t^2 \\a &= 28(4) + 1.5(4)^2 \\a &= 136 \text{ m/s/s}\end{aligned}$$