Year 12 Distance, Velocity & Acceleration Problems ANSWERS

1. A ball is kicked vertically upwards. Its height h in metres at t seconds is:

$h = 20t - 5t^2$

a) Find the velocity equation

$v = \dfrac{dh}{dt} = 20 - 10t$

b) Find t when v = 0

$20 - 10t = 0$

$t = 2\ sec$

c) Find maximum height of the ball

$sub\ t = 2\ in\ h = 20t - 5t^2$

$h = 40 - 20$

$h = 20\ m$

2. The velocity of a mechanical car is:

$v = \dfrac{dx}{dt} = 4 + 2t$

a) Find an equation for the distance travelled at t seconds given that x = 5m at t = 0

$x = 4t + t^2 + c$

$sub\ t = 0,\ x = 5 \quad 5 = 0 + 0 + c$

$x = 4t + t^2 + 5$

b)   Find x if t = 10 sec

$x = 40 + 100 + 5 = 145\ m$

3. If the acceleration is:

$a = \dfrac{dv}{dt} = 4\ m/s^2$

a) Find the velocity v given v=3 m/s at t=0.

$v = 4t + c$

$3 = 0 + c$

$v = 4t + 3$

b) Find the distance travelled x

$(note\ \dfrac{dx}{dt} = v)\ given\ that\ x = 2\ when\ t = 0$

$x = 2t^2 + 3t + p$

$2 = 0 + 0 + p$

$x = 2t^2 + 3t + 2$

4. If acceleration a = 6t

a) Find the equation for velocity v given v = 2 when t = 0

$v = 3t^2 + c$

$2 = 0 + c$

$v = 3t^2 + 2$

b) Find the equation for distance travelled x given x = 4 when t = 0

$x = t^3 + 2t + p$

$4 = p$

$x = t^3 + 2t + 4$

5. If acceleration $\dfrac{dv}{dt} = a$

a) Find the velocity equation given v = u at t = 0

$v = at + c$

$u = 0 + c$

$v = at + u$

$or \quad v = u + at$

b) Find the distance equation given x = 0 at t = 0

$x = \dfrac{at^2}{2} + ut + p$

$0 = p$

$x = \dfrac{at^2}{2} + ut$

$or \quad x = ut + \tfrac{1}{2}at^2$