

Higher Mathematics

Rates of Change - Questions - 2013-2017

Marks are indicated in brackets after each question number

2014 Paper 2 Question 9, (3) (2) (3)

Acceleration is defined as the rate of change of velocity.

An object is travelling in a straight line. The velocity, v m/s, of this object,

t seconds after the start of the motion, is given by $v(t) = 8\cos(2t - \frac{\pi}{2})$.

- (a) Find a formula for $a(t)$, the acceleration of this object, t seconds after the start of the motion.
- (b) Determine whether the velocity of the object is increasing or decreasing when $t = 10$.
- (c) Velocity is defined as the rate of change of displacement.
Determine a formula for $s(t)$, the displacement of the object, given that $s(t) = 4$ when $t = 0$.

2015 Paper 1 Question 15, (6)

The rate of change of the temperature, T °C of a mug of coffee is given by

$$\frac{dT}{dt} = \frac{1}{25}t - k, \quad 0 \leq t \leq 50$$

- t is the elapsed time, in minutes, after the coffee is poured into the mug
- k is a constant
- initially, the temperature of the coffee is 100 °C
- 10 minutes later the temperature has fallen to 82 °C.

Express T in terms of t .