

Examples: (Rates of change)
{ speed, velocity, displacement, acceleration }

* Physics:

- displacement → change of position of an object.

rate of change.
 $f'(x)$

- speed → rate of change of displacement
(distance moved / units of time)

- velocity → rate of change of displacement
in a particular direction,
(speed doesn't contain direction.)

- acceleration → rate of change of velocity.
 $f''(x)$

1) An oil tank is being drained. The volume, (in L), of oil remaining in tank after time 't', in minutes, is represented by the function

$$V(t) = 100(16-t)^2, \text{ where } 0 \leq t \leq 16.$$

- a) Determine the average rate of change of the volume in the first 8 minutes and the last 8 minutes. Compare these values.
- b) Determine the instantaneous rate of change of volume when $t = 5$ minutes

2) A stone is thrown vertically upwards. The height of the stone after t seconds is given by $h = 16t - 2t^2$ metres.

a) Determine the stone's velocity after:

i) 1 sec

ii) 3 sec

iii) 5 sec.

b) What do you think happened to the stone between 3 and 5 seconds?

c) After how many seconds will the stone reach its maximum height?

d) What is the maximum height the stone reaches?

e) After how many seconds will the stone reach the ground again?

f) Determine the acceleration of the stone.

3) The displacement of a particle is given by $s = 5t^2 - 2t$.

a) find its displacement at:

i) $t = 2 \text{ sec}$

ii) $t = 5 \text{ sec}$

b) Write down an expression for the velocity of the particle.

c) Determine the velocity of the particle at:

i) $t = 2 \text{ sec}$

ii) $t = 5 \text{ sec}$

d) Write an expression for acceleration of the particle at:

i) $t = 2 \text{ sec}$

ii) $t = 5 \text{ sec}$.