Your parents love you.

We are at rest during MindUp.

Today's learning objective:

By the end of class, I will be able to understand how particle motion has trigonometric properties.

Today's language objective:

*I will be able to recognize trigonometric derivatives and integrals.
*I will listen and offer solution strategies to a peer.

The velocity v m s^{-1} of a moving body at time t seconds is given by $v = 50 - 10t$.

(a) Find its acceleration in m s^{-2}.

$-10\ ms^{-2}$

(b) The initial displacement s is 40 metres. Find an expression for s in terms of t.

$\int (50 - 10t)\,dt$

$50t^0 \quad 10t^1$

$50t - \frac{10t^2}{2}$

$50t - 5t^2 + 40 = s(t)$

(Total 6

non-calc

A particle moves with a velocity v m s^{-1} given by $v = 25 - 4t^2$ where $t \geq 0$.

(a) The displacement, s metres, is 10 when t is 3. Find an expression for s in terms of t.

(b) Find t when s reaches its maximum value.

(c) The particle has a positive displacement for $m \leq t \leq n$. Find the value of m and the value of n.

calc

(Total 12

Let's go out in the hall and pretend to be helium.

The acceleration, a m s^{-2}, of a particle at time t seconds is given by

$$a = \frac{1}{t} + 3\sin 2t, \text{ for } t \geq 1.$$

The particle is at rest when $t = 1$.

Find the velocity of the particle when $t = 5$.

(Total

$v = 0$

$\int a = \ln t - \frac{3\cos 2t}{2} + C$

1) $\int$ outer $f(x)$
2) take deriv of embedded
3) divide that derivative

$0 = \ln 1 - \frac{3\cos 2(1)}{2} + C$

$C = \frac{3\cos 2}{2}$

non-calc

$v(5) = \ln 5 - \frac{3\cos 10}{2} + \frac{3\cos 2}{2}$

$\int \sin x\,dx = -\cos x + C$

$\int \frac{1}{x}dx = \ln x + C$

The acceleration, a m s^{-2}, of a particle at time t seconds is given by $a = 2t + \cos t$.

(a) Find the acceleration of the particle at $t = 0$.

(b) Find the velocity, v, at time t, given that the initial velocity of the particle is 2 m s^{-1}.

(c) Find $\int_0^3 v\,dt$, giving your answer in the form $p - q \cos 3$.

(d) What information does the answer to part (c) give about the motion of the particle?

displacement after 3s is $(16 - \cos 3)$ m

non-calc

$\int \cos x\,dx = \sin x + C$

Total 16 r

78.) A ball is dropped vertically from a great height. Its velocity v is given by

calc

$$v = 50 - 50e^{-0.2t}, t \geq 0$$

where v is in metres per second and t is in seconds.

(a) Find the value of v when

(i) $t = 0$; $v(0) = 50 - 50e^{-0.2(0)} = 0 \text{ ms}^{-1}$

(ii) $t = 10$. $v(10) = 50 - 50e^{-0.2(10)} = 50 - 50e^{-2} = \left(50 - \frac{50}{e^2}\right) \text{ms}^{-1}$ **(2)**

(b) (i) Find an expression for the acceleration, a, as a function of t.

$a = e^{-0.2t} \cdot -50 \cdot -0.2 = 10e^{-0.2t}$

(ii) What is the value of a when $t = 0$?

$a(0) = 10 \text{ ms}^{-2}$ **(3)**

(c) (i) As t becomes large, what value does v approach?

50 ms^{-1}

(ii) As t becomes large, what value does a approach?

0 ms^{-2}

(iii) Explain the relationship between the answers to parts (i) and (ii).

constant v yields 0 a **(3)**

(d) Let y metres be the distance fallen after t seconds.

(i) Show that $y = 50t + 250e^{-0.2t} + k$, where k is a constant.

(ii) Given that $y = 0$ when $t = 0$, find the value of k.

(iii) Find the time required to fall 250 m, giving your answer correct to **four** significant figures.