

Common application of differentiation question

differentiation = division

s = distance

$$\frac{ds}{dt} = \text{speed} = v$$

v = velocity

$$\frac{dv}{dt} = \text{acceleration} = a$$

V = Volume

$$\frac{dV}{dt} = \text{change in Volume in time}$$

P.61
S2P1Q5(e)

need expression
for Volume in
terms of time.

use "initial values"
to evaluate c

$$t=0 \\ V=2250$$

When $V=0$
 $t=?$
Solve

$$V = 2250 \text{ cm}^3$$

* note: this
is an unusual
question

$$\frac{dV}{dt} = -(2t+5)$$

Find time for Box to empty. ?

$$\int dV = -\int (2t+5) dt$$

$$V = -\left(\frac{2t^2}{2} + 5t\right) + c$$

$$V = -t^2 + 5t + c$$

$$\Rightarrow 2250 = 0 + 0 + c \Rightarrow c = 2250$$

$$V = -t^2 + 5t + 2250$$

$$\Rightarrow 0 = -t^2 + 5t + 2250$$

$$t^2 - 5t - 2250 = 0$$

$$(t-50)(t+45) = 0 \Rightarrow t = 50 \text{ s}$$