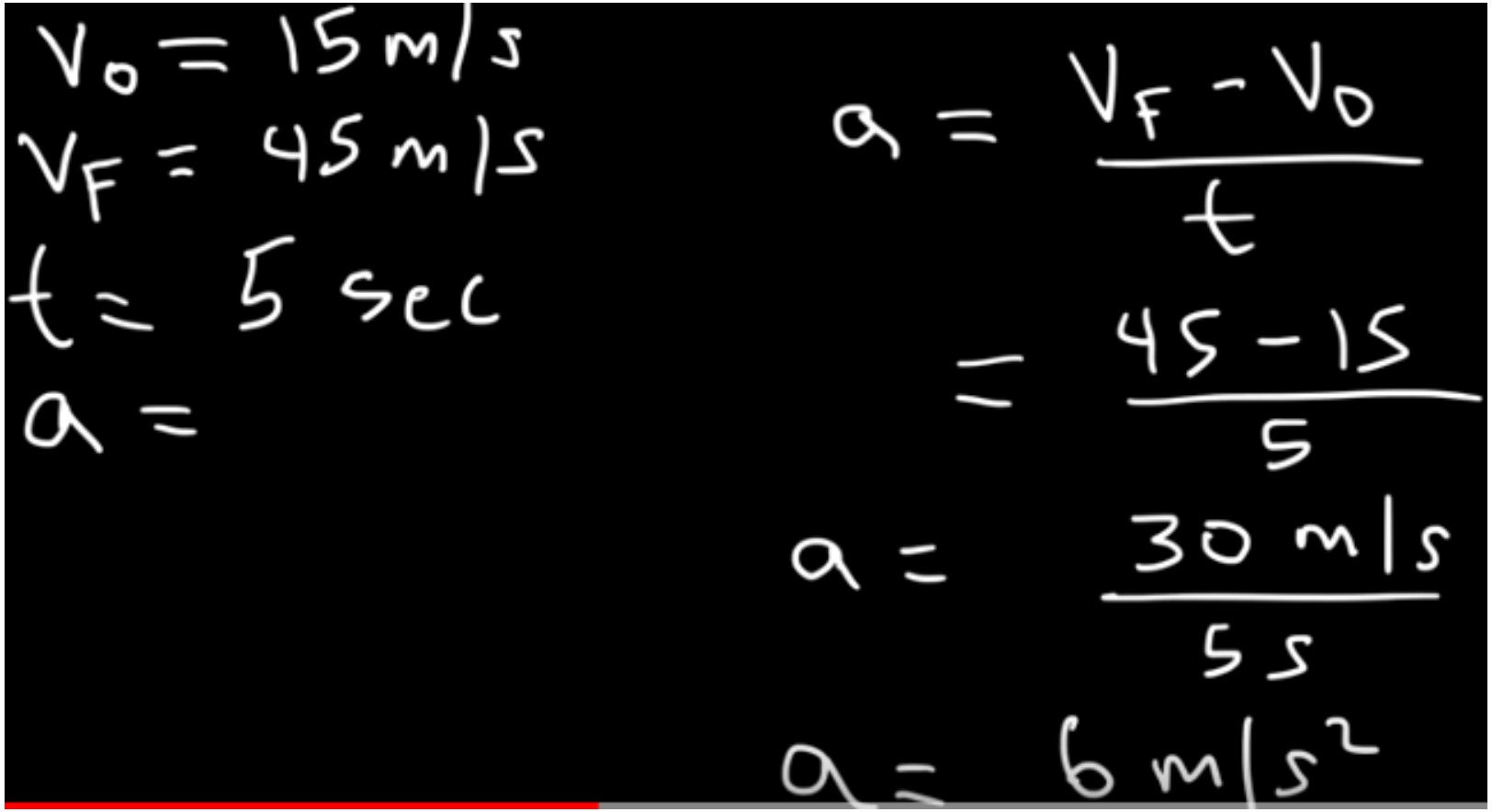
Average Acceleration Problems

Example #1

- A car accelerates from 15 m/s to 45 m/s in 5 seconds. Calculate the average acceleration of the car.


$V_0 = 15\ m/s$
$V_F = 45\ m/s$
$t = 5\ sec$
$a =$
$a = \frac{V_F - V_0}{t}$
$= \frac{45 - 15}{5}$
$a = \frac{30\ m/s}{5\ s}$
$a = 6\ m/s^2$

#2

- A truck accelerates from 25 km/hr to 45 km/hr in 40 seconds. Calculate the average acceleration of the vehicle in km/hr/s.

$V_0 = 25$ km/hr

$V_F = 45$ km/hr

$t = 40$ sec

a

$$\bar{a} = \frac{V_F - V_0}{t}$$

$$\bar{a} = \frac{45 - 25}{40}$$

$$= \frac{20 \text{ km/hr}}{40 \text{ s}}$$

$$= 0.5 \text{ km/hr/s}$$

#3

- A car accelerates from rest at a constant rate of 3.5 m/s/s. What is the speed of the car 12 seconds later?

$v_0 = 0$

$v_F = ?$

$t = 12\,s$

$a = 3.5\,m/s^2$

$v_F = v_0 + at$

$= 0 + 3.5(12)$

$v_F = 42\,m/s$

#4

- A bus accelerates from an initial speed of 12 m/s at a constant rate of 1.2 m/s/s. What is the final speed of the bus after 15 seconds?

$V_0 = 12\ m/s \quad a = 1.2\ m/s \quad t = 15\ s \quad V_F = ?$

$$V_F = V_0 + at$$

$$= 12 + 1.2(15)$$

$$= 12 + 18$$

$$V_F = 30\ m/s$$

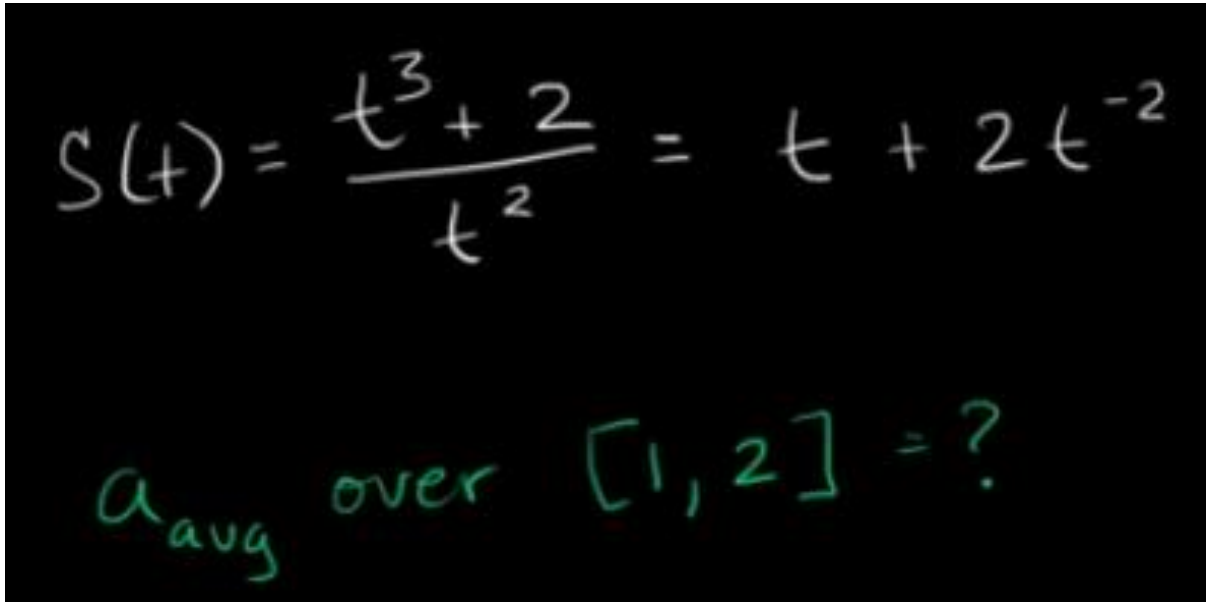
#5

- A sports car driver is traveling at 42.47 m/s slams the brakes and comes to rest in 4 seconds. Calculate the average acceleration of the car in and m/s/s.

$$a = \frac{V_F - V_0}{t}$$

$$a = \frac{0 - 42.47}{4} = -10.6 \text{ m/s}^2$$

#6*



$$s(t) = \frac{t^3 + 2}{t^2} = t + 2t^{-2} \qquad v(t) = 1 - 4t^{-3}$$

a_{avg} over $[1, 2]$ = ? $\qquad a(t) = 12t^{-4}$

$$a_{avg} = \frac{1}{2-1} \int_1^2 12t^{-4}\,dt = \left[-4t^{-3}\right]\Big|_1^2$$

$$= \left[-4\cdot\frac{1}{8} - (-4)\right] = 3\frac{1}{2} = \frac{7}{2}$$