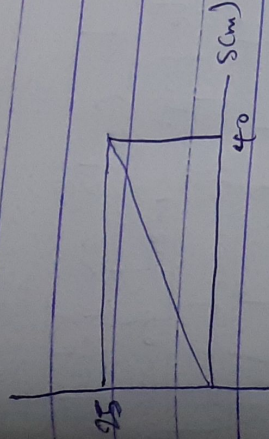


F12-11) $a ds = v dv$

$a = \frac{v dv}{ds} = 0.25 \frac{d(0.25s)}{dt} = 0.0625s$

$a_0 = 40 \text{ m} = 0.0625(40 \text{ m}) = 2.5 \text{ m/s}^2$
 $a \text{ (m/s}^2\text{)}$



F12-12)

$0 \leq t < 5 \text{ s}$

$v = \frac{ds}{dt} = \frac{d}{dt}(3t^2) = (6t) \text{ m/s}$

$5 \text{ s} \leq t < 10 \text{ s}$

$v = \frac{ds}{dt} = \frac{d}{dt}(30t - 75) = 30 \text{ m/s}$

$0 \leq t < 5 \text{ s}$

$a = \frac{dv}{dt} = \frac{d}{dt}(6t) = 6 \text{ m/s}^2$

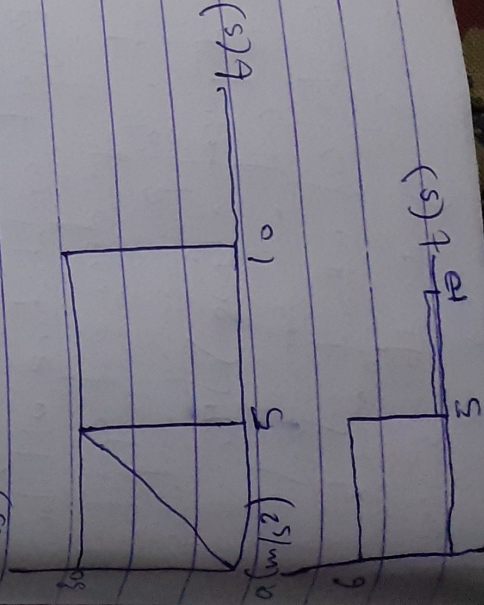
$5 \text{ s} < t < 10 \text{ s}$

$a = \frac{dv}{dt} = \frac{d}{dt}(30) = 6 \text{ m/s}^2 = 0$

$0 \leq t < 5 \text{ s}, a = \Delta v / \Delta t = 6 \text{ m/s}^2$

$5 \text{ s} \leq t < 10 \text{ s}, a = \Delta v / \Delta t = 0$

(m/s)



F12-13)

$0 \leq t < 5 \text{ s}$

$dv = a dt \int_0^v dv = \int_0^t 2t dt$

$v = (20t) \text{ m/s}$

$5 \text{ s} < t \leq 10$

$\int_{20(5)}^{100} dv = a dt \int_{50}^{100} ds = \int_{50}^{100} -10 dt$

$v = 100 = (50 - 10t) \text{ m/s}$

$0 = 150 - 10t$

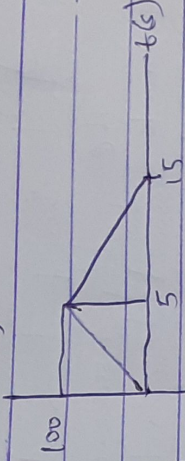
$t = 15 \text{ s}$

Also

$\Delta v = 0 = \text{Area under the a-t graph}$
 $0 = (20 \text{ m/s}^2)(5 \text{ s}) + \int_{50}^{100} (-10 \text{ m/s}^2)(t-5) dt$

$t = 15 \text{ s}$

$v \text{ (m/s)}$



F12-14)

$0 \leq t \leq 5 \text{ s}$

$ds = v dt \int_0^s ds = \int_0^t 20t dt$

$s \Big|_0^t = 15t^2 \Big|_0^t$

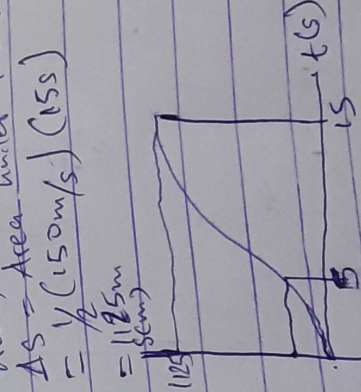
$s = (15t^2) \text{ m}$

$5 \text{ s} < t \leq 15 \text{ s}$
 $\int_{(15)^2}^{1225} ds = v dt, \int_{1125 \text{ m}}^{1225 \text{ m}} ds = \int_{5 \text{ s}}^t (-15t + 225) dt$

$s = (-7.5t^2 + 225t - 562.5) \text{ m}$

$s = (-7.5)(15)^2 + 225(15) - 562.5 \text{ m}$
 $= 1125 \text{ m}$

(m/s)



Also, Area under the v-t graph

$\Delta s = \text{Area under the v-t graph}$

$= \frac{1}{2}(150 \text{ m/s})(15 \text{ s})$

$= 1125 \text{ m}$

(semicircle)

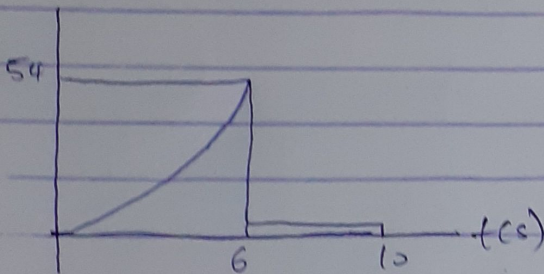
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F2-9)

$$v = \frac{ds}{dt} = \frac{d}{dt}(30 - 5t^2) = -10t$$

$$v = \frac{ds}{dt} = \frac{d}{dt}(10s) = 0$$

v (in ft/s)



F12-10.)

$$ds = v dt$$

$$\int_0^s ds = \int_0^t (-4t + 80) dt$$

$$s = -2t^2 + 80t, \quad a = \frac{dv}{dt} = \frac{d}{dt}(-4t + 80) = -4 \text{ ft/s}^2 = 4 \text{ ft/s}^2$$

Also

$$a = \frac{\Delta v}{\Delta t} = \frac{0 - 80 \text{ ft/s}}{20 \text{ s} - 0} = -4 \text{ ft/s}^2$$

