2.53 | Fecha

Datos

$a_{(t)} = At - Bt^2$

$A = 1.5\ m/s^3$

$B = 0.12\ m/s^4$

$x_{(t)} = ?$

$v_{(t)} = ?$

$v_{max} = ?$

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

$a\,dt = dv$

$$\int_0^t a\,dt = \int_{v_{(0)}}^{v_{(t)}} dv$$

$$\int_0^t (At - Bt^2)\,dt = \int_{v_{(0)}}^{v_{(t)}} dv$$

$$\int_0^t At\,dt - \int_0^t Bt^2\,dt = \int_{v_{(0)}}^{v_{(t)}} dv$$

$$\frac{At^2}{2}\Big|_0^t - \frac{Bt^3}{3}\Big|_0^t = v\Big|_{v_{(0)}}^{v_{(t)}}$$

$$\frac{At^2}{2} - \frac{Bt^3}{3} = v_{(t)} - v_{(0)} \Rightarrow \boxed{0.75t^2 - 0.04t^3 = v_{(t)}}$$

$v = \frac{dx}{dt}$

$v\,dt = dx$

$(0.75t^2 - 0.04t^3)\,dt = dx$

$$\int_0^t 0.75t^2\,dt - \int_0^t 0.04t^3\,dt = \int_{x_{(0)}}^{x_{(t)}} dx$$

$$\frac{0.75t^3}{3}\Big|_0^t - \frac{0.04t^4}{4}\Big|_0^t = x\Big|_{x_{(0)}}^{x_{(t)}}$$

$$\boxed{0.25t^3 - 0.01t^4 = x_{(t)} - x_{(0)}}$$

$At - Bt^2 = 0$

$t = \frac{A}{B} = \frac{1.5}{0.12} = 12.5\ s$

$v_{max} = 0.75(12.5)^2 - 0.04(12.5)^3$

$\boxed{v_{max} = 39.1\ m/s}$