20-P-MOM-PT-005

December 31, 2020   3:09 AM

Find the impulse of the force $F=222\ t^{333}$ N between 2.22 and 3.33 seconds.

$$I = \int_{t_1}^{t_2} F\,dt = \int_{2.22}^{3.33} 222\,t^{333}\,dt = \frac{2.22}{4.33}\,t^{4.33}\Big|_{2.22}^{3.33} = \frac{2.22}{4.33}(3.33)^{4.33} - \frac{2.22}{4.33}(2.22)^{4.33}$$

$$\boxed{I \approx 77.6\ kg\ m/s}$$

The force acts on an object with a mass of 4.44 kg between 2.22 and 3.33 seconds. If the object had an initial velocity of 5.55 m/s, what is its new velocity? Assume that there are no other forces acting on the object.

$$m_1 v_1 + \int F\,dt = m_1 v_2$$
$$m_1 v_1 + I \approx m_1 v_2$$
$$v_2 = \frac{m_1 v_1 + I}{m_1} \approx \frac{4.44(5.55) + 77.6}{4.44}$$

$$\boxed{v_2 = 23.0\ m/s}$$