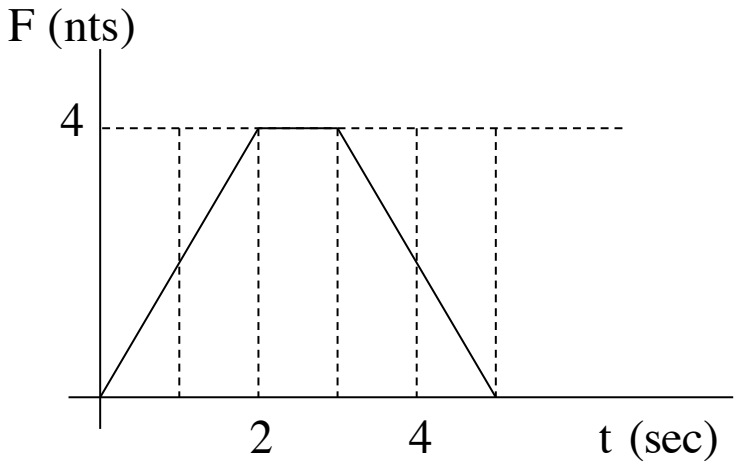
Problem 6.16

The force on a 2 kg mass is shown in the sketch.



a.) What's the impulse on the mass?

b.) If initially at rest, what's its final velocity?

c.) If initially moving at -2 m/s, what its final velocity?

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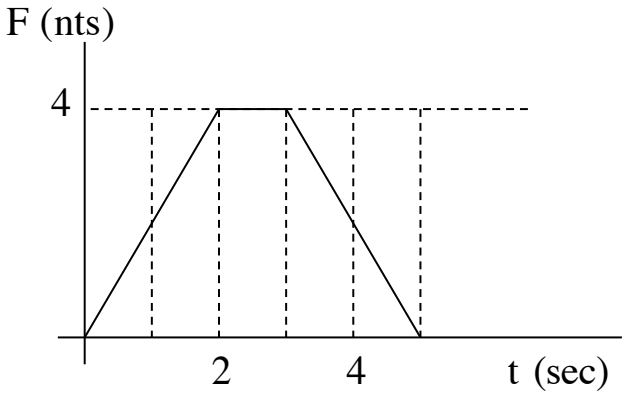


a.) What's the impulse on the mass?

This is either the change of momentum or the area under the *force versus time* graph. From the graph, the impulse is:

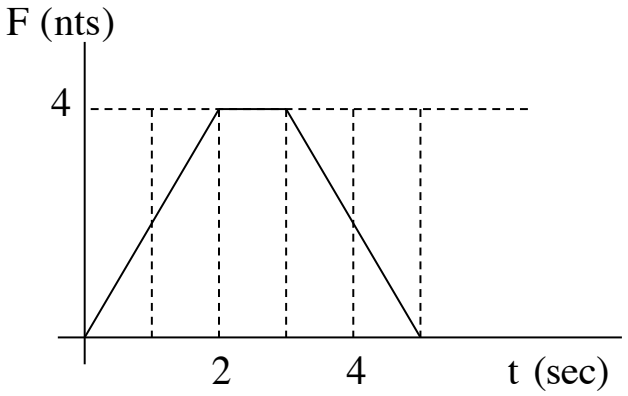
$$J = \frac{1}{2}(4\ \text{nt})(2\ \text{sec}) + (4\ \text{nt})(1\ \text{sec}) + \frac{1}{2}(4\ \text{nt})(2\ \text{sec})$$
$$= 12\ \text{nt} \bullet \text{sec}$$

b.) If initially at rest, what's its final velocity?

Knowing the impulse, we can write:

$$J = \Delta p$$
$$= (mv_f) - (mv_o)$$
$$= (2\ \text{kg})v_f$$
$$= 12\ \text{nt} \bullet \text{sec}$$
$$\Rightarrow \quad v_f = 6\ \text{m/s}$$

c.) If initially moving at -2 m/s, what its final velocity?



Again, knowing the net impulse yields:

$$
\begin{aligned}
J &= \Delta p \\
&= \left(mv_f\right) - \left(mv_o\right) \\
&= (2\ \text{kg})v_f - (2\ \text{kg})(-2\ \text{m/s}) \\
&= 12\ \text{nt} \bullet \text{sec} \\
&\Rightarrow \quad v_f = 4\ \text{m/s}
\end{aligned}
$$