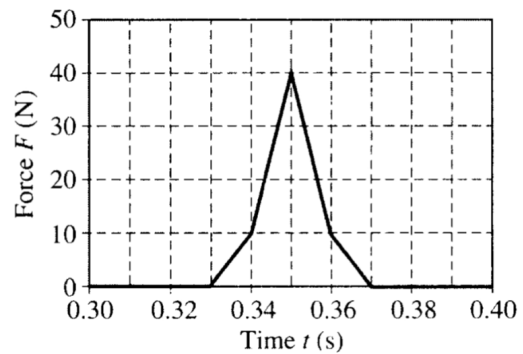
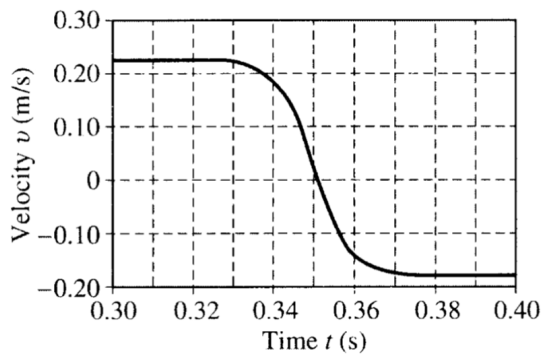
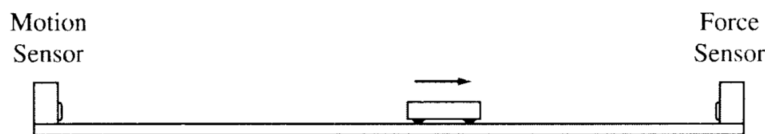


1976B2.

A bullet of mass m and velocity v_0 is fired toward a block of mass $4m$. The block is initially at rest on a frictionless horizontal surface. The bullet penetrates the block and emerges with a velocity of $\frac{v_0}{3}$

- Determine the final speed of the block.
- Determine the loss in kinetic energy of the bullet.
- Determine the gain in the kinetic energy of the block.



2001M1. A motion sensor and a force sensor record the motion of a cart along a track, as shown above. The cart is given a push so that it moves toward the force sensor and then collides with it. The two sensors record the values shown in the following graphs.

- Determine the cart's average acceleration between $t = 0.33$ s and $t = 0.37$ s.
- Determine the magnitude of the change in the cart's momentum during the collision.
- Determine the mass of the cart.
- Determine the energy lost in the collision between the force sensor and the cart.