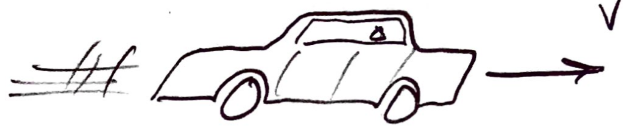
9/20



v = 10 m/s, East

m = 2000 kg

$$\vec{p} = m\vec{v}$$

$$= (2000\ \text{kg})(10\ \text{m/s, East})$$

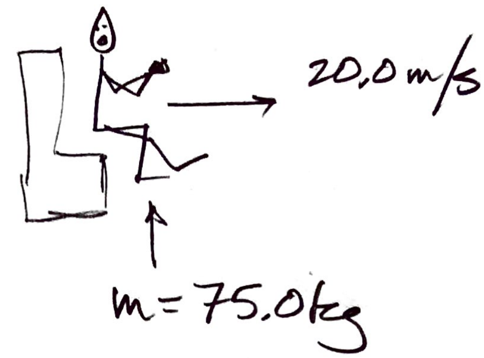
$$= \boxed{20{,}000\ \text{kg}\cdot\text{m/s, East}}$$

$$= \underline{2.0e4}\ \text{kg}\cdot\text{m/s, East}$$

↑

correct sig figs!

9.25



a) Average force if stopped by "padded" dashboard.

Impulse $J = \Delta p$

$$F \cdot t = p_f - p_i$$

$$F = \frac{mv_f - mv_i}{t} = \frac{75(0 - +20)}{t}$$

We know distance, but not the time to stop. Calculate it?

$$v_{avg} = \frac{x}{t}, \text{ or } \quad \Delta t = \frac{x}{\frac{v_i + v_f}{2}} = \frac{0.01\,m}{\frac{20+0}{2}}$$

$$= 0.001\,s$$

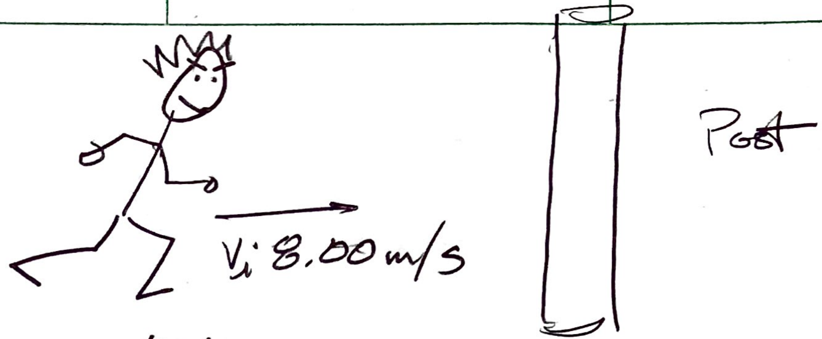
$$F = \frac{75(0-20)}{0.001\,s} = \boxed{-1.5e6\,N}$$ ouch!

b) If stopped by air bag:

$$\Delta t = \frac{x}{\frac{v_i + v_f}{2}} = \frac{0.15\,m}{10} = 0.015\,s$$

$$F = \frac{75(-20)}{0.015} = \boxed{-1.0e5\,N}$$ Still, ouch!

9.28



$m = 110\,kg$

$F = -1.76e4\,N$

$t = 5.50e{-2}\,s$

$v_f = ?$

$$Ft = m\Delta v$$

$$Ft = m(v_f - v_i)$$

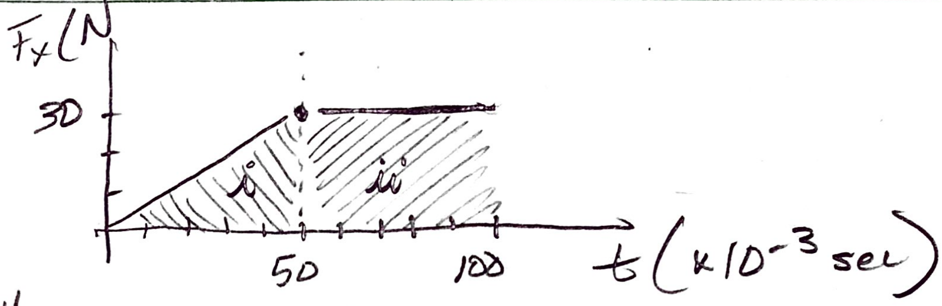
$$v_f = \frac{Ft}{m} + v_i$$

$$= \frac{(-1.76e4)(5.50e{-2})}{110} + 8.00$$

$$= \boxed{-0.80\,m/s}$$

Bounces back, away from post.

9,32



Golf ball $m = 0{,}046\,kg$

a) x-component of Impulse during

i. $\int F \cdot dt$ = area under curve = $\frac{1}{2}(50e{-}3 \times 30) = $ **0,75 N·s**

ii $\int F \cdot dt = (30 \times 50e{-}3) = $ **1,5 N·s**

b) Change in the x-component of the momentum during those intervals?

It's the same thing.

i. Impulse is change in momentum! **0,75 N·s** or **0,75 kg·m/s**

ii I mean, it causes a change in momentum, equal to the impulse. **1.5 N·s** or **1.5 kg·m/s**