From HW (PP 296)

11.

$k = 485\,N/m$

$x = +45.0\,cm$

$m = 0.030\,kg$.

equilibrium.

Law of Conservation of Mech. Energy

$$E_{total} = E'_{total}$$

(fully stretched) (equilibrium)

$$E_e + E_k = E_e + E_k'$$

$$E_e + 0 = 0 + E_k'$$

$$\frac{1}{2}kx^2 = \frac{1}{2}mv^2$$

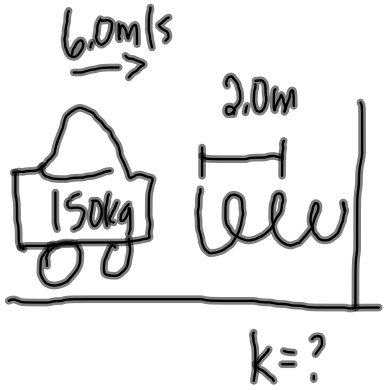
$$kx^2 = mv^2$$

$$v^2 = \frac{kx^2}{m}$$

$$v^2 = \frac{(485\,N/m)(0.450\,m)^2}{0.030\,kg}$$

$$v = 57.2\,m/s$$

10.



$E_{total} = E'_{total}$

(car moving) (spring is fully compressed)

$E_e + E_k = E_e' + E_k'$

$0 + \frac{1}{2}mv^2 = \frac{1}{2}kx^2 + 0$

$\frac{1}{2}mv^2 = \frac{1}{2}kx^2$

$mv^2 = kx^2$

$k = \frac{mv^2}{x^2}$

$k = \frac{(150kg)(6.0m/s)^2}{(2.0m)^2}$

$k = 1350 N/m$

$k = 1.4 \times 10^3 N/m$

§7-3 Conservation of Momentum

Recall Newton's 3rd Law:

B on A → $\vec{F}_{(A)} = -\vec{F}_{(B)}$ ← A on B

$\vec{F}_A \Delta t = -\vec{F}_B \Delta t$

Law of Cons. of Mom. $\boxed{\Delta\vec{p}_A = -\Delta\vec{p}_B}$ (one object's loss in momentum is the other's gain)

$\vec{p}_A' - \vec{p}_A = -(\vec{p}_B' - \vec{p}_B)$

$\vec{p}_A' - \vec{p}_A = -\vec{p}_B' + \vec{p}_B$

$\vec{p}_A' + \vec{p}_B' = \vec{p}_A + \vec{p}_B$

LAW OF CONSERVATION OF MOMENTUM → $\boxed{\vec{p}_{total} = \vec{p}_{total}'}$

← for an isolated system i.e. no friction

* applies to EVERY collision

MP 3/13

	BEFORE		AFTER
	Car A	Car B	Car (A+B)
m	1.75×10^4 kg	2.00×10^4 kg	3.75×10^4 kg
v	+5.45 m/s	0	v
p (mv)	+95375 kg·m/s	0	$(3.75 \times 10^4 \text{ kg})v$

\+ east
− west

$\vec{p}_{total}$ $\vec{p}'_{total}$

$$\vec{p}_{total} = \vec{p}'_{total}$$

$$+95375 \text{ kg·m/s} + 0 = (3.75 \times 10^4 \text{ kg})v$$

$$v = \frac{+95375 \text{ kg·m/s}}{3.75 \times 10^4 \text{ kg}}$$

$$v \doteq +2.54 \text{ m/s}$$

$$\vec{v} \doteq 2.54 \text{ m/s [east]}$$

MP|316

	BEFORE	AFTER	
	You + canoe	You	Canoe
m	180 kg	65 kg	115 kg
v	0	+0.75 m/s	v
p	0	+48.75 kg·m/s	(115 kg)v

p_{total} p'_{total}

+ forward

= backwards

$\vec{p}_{total} = \vec{p}'_{total}$

$0 = +48.75\ kg\cdot m/s + (115\ kg)(v)$

$-48.75\ kg\cdot m/s = (115\ kg)\,v$

$v = -0.42\ m/s$

$\vec{v} = 0.42\ m/s$ [backwards]

TO DO

① PP|315

② PP|317