Name _____ Section (circle one): 0810 0910

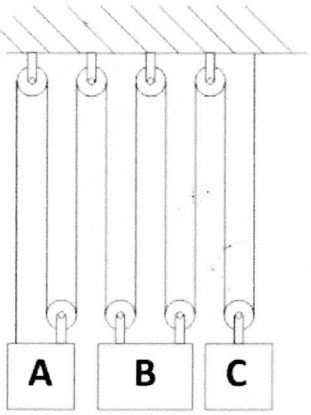
ME 212 – Quiz 1

Winter 2012

Solve the problems below on this paper in the spaces provided. In your solutions you need to show not only the answers but the steps or rationale you used to arrive at the answer. If you perform special actions on your calculator (like a SOLVE or a cross product), write out the steps you used and precisely what you entered into the calculator. Your answers need to be complete enough to make your work *checkable.* Box your final answers. If you need more space, you may attach a paper with the continued part of the problem clearly designated as the continued part.

1. (30% of quiz points)

   a. Develop a relationship between the velocity of the three blocks—v_A, v_B, and v_C.



$$\ell_{tot} = 3x_A + 4x_B + 2x_C + \ell_{rest}$$

$$\boxed{0 = 3v_A + 4v_B + 2v_C}$$ (3)

   b. If block B is held still and block C is moved downward with a velocity v, what will be the velocity of block A?

$$v_B = 0, \quad v_C = v$$

$$v_A = -\frac{2}{3}v_C = \boxed{-\frac{2}{3}v = v_A \text{ upward}}$$ (2)

   c. If block A is held still and block C is moved downward with a velocity v, what will be the velocity of block B?

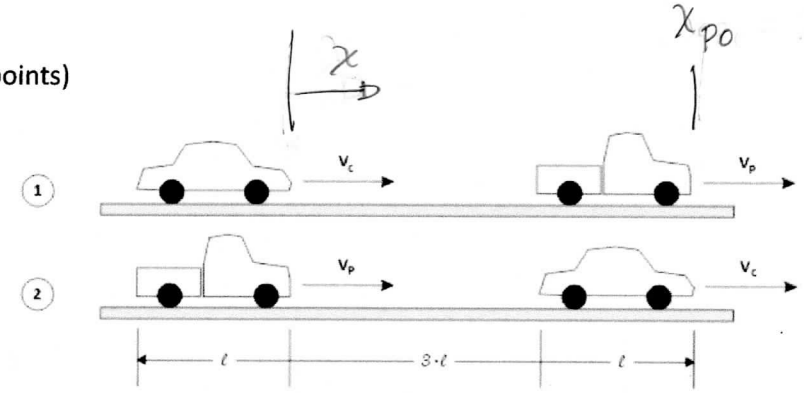
$$v_A = 0, \quad v_C = v$$

$$\boxed{v_B = -\frac{2}{4}v_C = -\frac{1}{2}v = v_B \text{ upward}}$$ (2)

   d. If block C is held still and block A is moved downward with a velocity v, what will be the velocity of block B?

$$v_B = -\frac{3}{4}v_A = \boxed{-\frac{3}{4}v = v_B \text{ upward}}$$ (2)

2. (70% of quiz points)



Must measure each vehicle from same spot, here from the front. Would get same answer if measured from the rear. But must measure both using same reference point on the vehicle.

Going up the Cuesta Grade a car is moving at the constant speed v_c and a pickup at the constant speed v_p. For this scenario, the car starts 3 car-lengths behind the pickup and passes the pickup. At the end state of interest, the car has moved three car-lengths ahead of the pickup, as shown above. Answer the following question in terms of the variables given in the drawing above (v_c, v_p, ℓ).

a. How long does it take to go from state 1 to state 2?

$v_p t = \Delta x_p$ (distance pickup goes)

$\Delta x_c = \Delta x_p + 8\ell = v_p t + 8\ell = v_c t$ — (2) (distance car goes)

(6) $t = \dfrac{8\ell}{v_c - v_p}$ (2)

b. How far does each vehicle travel while going from state 1 to state 2?

(3) $\Delta x_p = v_p \dfrac{8\ell}{v_c - v_p}$

(3) $\Delta x_c = v_c \dfrac{8\ell}{v_c - v_p}$

or $x_p = v_p t + x_{po}$

$x_p = v_p t + 4\ell$

$x_c = v_c t + x_{co} = v_c t$

At t, $x_c = x_p + 4\ell$

$v_c t = v_p t + 4\ell + 4\ell = v_p t + 8\ell$

$t = 8\ell/(v_c - v_p)$ (Same as above)