PHY218 RECITATION WEEK 2 YOUR NAME:

GROUP QUIZ GROUP NUMBER:

You and your friend are playing catch.

You see that your friend has lobbed the ball toward you with a speed of v_0 at an angle of θ with respect to the horizontal ground. They release the ball from their waist which is a height, h_0, above the ground. You also see that you are a distance, d, away from your friend. You need to jump to catch the ball at a certain vertical distance right above your head. Your body with your arms fully stretched upward is height, h_p, at the instant your feet leave the ground. Assume you are in a constant gravitional acceleration, g, downwards.

HINT: Think about what has to be true in order to make your jump the most efficieint.

(a) Draw a BIG diagram with labels for the above variables. This is crucial for getting this problem right (check to ensure that all group members have the same diagram and labels and THEN show your diagram to your Recitation instructor before rushing to solve the problem). (Part (b) on back)

(b) Verify that the time from you leaving the ground to you catching the ball is

$$t_{jump} = \sqrt{\frac{2\left(h_0 - h_p + d\tan\theta - \frac{1}{2}g\left(\frac{d}{v_0\cos\theta}\right)^2\right)}{g}}.$$

Then find t_{jump} for $v_0 = 12.5\,\mathrm{m/s}$, $h_0 = 0.9\,\mathrm{m}$, $\theta = 30°$, $d = 11\,\mathrm{m}$, $g = 9.81\,\mathrm{m/s^2}$, and $t_p = 1.85\,\mathrm{m}$.

HINT: Work out this problem in parts. What is the ball doing? What are you doing? At what time is everything happening?