

Your Name \_\_\_\_\_ Section \_\_\_\_\_

## HOMEWORK #2 - 8.01 MIT - Prof. Kowalski

Due 4:00PM Thursday Sept. 18, 2003

### Topics: Vectors and Two dimensional motion

The following problems are from Young and Freedman 11<sup>th</sup> edition.

1. 1.38
2. 1.70
3. 1.50
4. 1.52

Find the vector product of the three vector pairs given in this problem (1.52).

5. 2.27
6. 2.98

### 7. Indoor Cannon

A toy cannon is placed on the floor of a large room with a ceiling whose height is  $H$ . The cannon fires its ball with speed  $v_0$ . The objective in this problem is to give an analytic expression for the farthest that the cannon can shoot (at the optimized angle) without having the ball hit the ceiling.

- a) Below a certain  $v_0$ , call it  $v_{\text{crit}}$  the presence of the ceiling does not affect the maximum range of the cannon. Find the range and the  $v_0$  at which the ceiling first limits the range.
- b) Above  $v_{\text{crit}}$  the ceiling limits the range. Find the range,  $R(H)$ , in this regime.
- c) How much does a ceiling with  $H = 5\text{m}$  restrict the range of a cannon with  $v_0 = 20\text{ m/s}$ ? Find the distance lost,  $R_{\text{lost}}$