

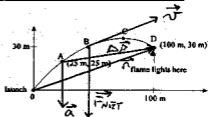
EXAM 1

Name: _____ Student ID #: _____

TA (circle one): Beetle Flitcroft McKain Pokrovski

PROB. 1
34 PTS

A. The following shows the path of the arrow fired at the opening ceremonies of the Barcelona Olympics that lit the Olympic flame. Assume no air resistance. Do all drawings on graph.



- [3 pts.] Draw the position vector, \vec{r} to location where the flame lights. Include a label.
- [3 pts. each] Write out this position vector in two ways: (a) magnitude and direction, and (b) in unit vector form.

(a) $r = \sqrt{(100\text{m})^2 + (30\text{m})^2} = 104\text{m}$ $\theta = \tan^{-1} \frac{30\text{m}}{100\text{m}} = 16^\circ$

(b) $\vec{r} = (100\text{m})\hat{x} + (30\text{m})\hat{y}$

- [3 pts.] At location B draw the velocity vector. Include a label.
- [3 pts.] At location A draw the acceleration vector. Include a label.
- [3 pts.] In unit vector form write down the displacement vector ($\Delta\vec{r}$) between A and D. Draw it. Label it.

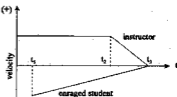
$\Delta\vec{r} = (75\text{m})\hat{x} + (15\text{m})\hat{y}$

- [3 pts.] At B draw an arrow to represent the net force the arrow feels. Include a label.
- [2 pts.] List all the external forces the arrow feels when it is at C.

WEIGHT

- [2 pts.] At what location (O, A, B, C and/or D) is the speed of the arrow largest? O

B. One Dimensional Physics Rage: After a very nasty physics exam an enraged student decides to assault the now terrified instructor. The instructor begins his motion earlier than the student's. The following shows a velocity vs. time plot for both 1-D motions.



- [4 pts.] In words, describe the motions of both people.

INSTRUCTOR TRAVELS WITH CONSTANT $v^2 > 0$ FROM t_1 TO t_3 AND THEN SLOWS UNIFORMLY UNTIL HE STOPS AT t_3 . STUDENT STARTS AT t_1 WITH INITIAL $v_0 < 0$ AND SLOWS UNIFORMLY ($a > 0$) UNTIL SHE STOPS AT t_3 ALSO.

- [3 pts.] On the graph to the right, show the acceleration vs. time of each person up to time t_3 .
- [2 pts.] If the two people started from the same place, does the student catch the teacher? Explain.

NO! THEY ARE GOING IN OPPOSITE DIRECTIONS

