

Name _____

TA: _____

Section: _____

Instructions:

- Your exam contains 3 problems.
- Your exam should contain 4 pages; please make sure you have a complete exam.
- Box in your final answer when appropriate.
- Unless stated otherwise, you **MUST** show work for credit. No credit for answers only. If in doubt, ask for clarification.
- Your work needs to be neat and legible.
- You are allowed one 8.5×11 sheet of notes (both sides). Graphing calculators are **NOT** allowed; scientific calculators are allowed.
- Round off your answers to 2 decimal places, unless you are asked for exact answers.

Problem #1 (25 pts) _____

Problem #2 (15 pts) _____

Problem #3 (20 pts) _____

TOTAL (60 pts) _____

1. At time $t = 0$ Tom leaves his house and starts driving North on a straight road at a constant speed of 30 mph. At the same time Bob leaves from a location situated 20 mi East and 40 mi North of Tom's house and starts driving on a straight road directly towards a location situated 10 mi West of Tom's house; Bob drives at a constant speed of 50 mph. Set up a coordinate system with the origin O corresponding to Tom's house, the x axis in the West East direction, the y axis in the South North direction.

(a) Give Tom's coordinates at time t ($t \geq 0$).

(b) Give Bob's coordinates at time t ($t \geq 0$).

(c) When are Tom and Bob closest ?

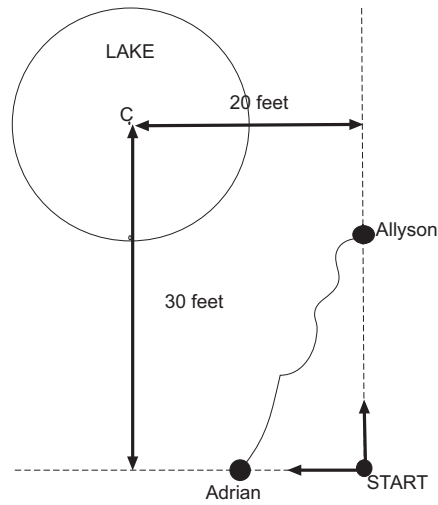
2. Given the function

$$f(x) = \begin{cases} 3x + 2, & \text{if } x \leq 1 \\ 5 - \sqrt{1 - (x - 2)^2}, & \text{if } 1 < x \leq 3 \\ 6 & \text{if } x > 3 \end{cases}$$

(a) Draw the graph of $y = f(x)$. Make sure to mark all relevant points on the axes.

(b) Find all solutions of the equation $f(x) = 4.5$

3. Allyson and Adryan have decided to connect their ankles with a bungee cord; one end is tied to each person ankle. The cord is 30 feet long, but it can stretch up to 90 feet . They both start at the same location. Allyson moves 10 ft/sec and Adryan moves 5 feet/sec in the directions indicated. Next to their starting location there is a lake that has the shape of a circle of radius 10 feet.



(a) Determine when the bungee cord first becomes tight (i.e. 30 feet long).

(b) At time $t = 6$ sec, how much of the bungee cord is over the water ?