Math 120 (Pezzoli)
Spring 2019
Midterm #1

Name _____

TA: _____

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Section: _____

Instructions:

- Your exam contains 2 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).
- The only calculator allowed is the Ti-30x IIS.
- Round off your answers to 3 decimal places, unless you are asked for exact answers.

Problem #1 (20 pts) _____

Problem #2 (20 pts) _____

TOTAL (40 pts) _____

1. A United Airlines plane is flying in a straight line towards a control tower with a speed of 250 mi/hour. At time $t = 0$ it is located 300 mi East and 400 mi South of the control tower. Use a coordinate system with the origin at the control tower.

   (a) Find the parametric equations of motion for the United Airlines plane.

   (b) An American Airlines plane is flying North at a speed of v mph. At time $t = 1$ it is located 100 mi East and 160 mi South of the control tower. It flies at the same altitude as the United Airlines plane. For which value of v do the two planes collide?

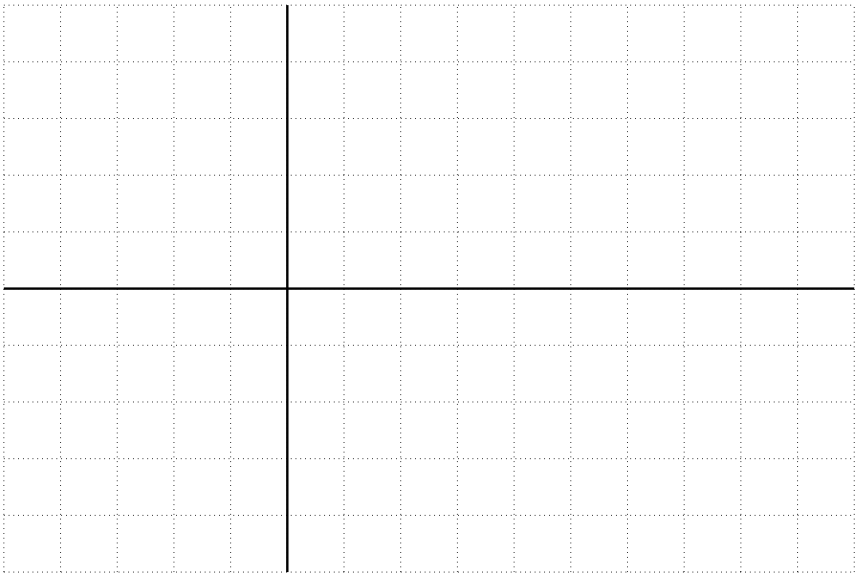
(problem 1 continued)

(c) If the speed of the American Airlines plane is 240 mph (instead of the value v you found in part (b)), when are the two planes closest? How close do they get?

2. The function f is defined as follows :

$$f(x) = \begin{cases} \sqrt{9-(x-1)^2} - 2, & \text{if } -2 \leq x \leq 4 \\ 3-(x-5)^2, & \text{if } x > 4 \end{cases}$$

(a) Draw the graph of f.



(b) Find the y intercept, and mark it on the graph you drew in part (a).

(c) Find the range of f.

(d) Find the x intercepts and mark them on the graph you drew in part (a).