**Math 120 Section** **Midterm I, January 25th** **Winter 2024**

HONOR STATEMENT
I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam.

Name

Signature

Student ID #

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- Silence your phone and put it away.
- You have 50 minutes for 4 problems. Check your copy of the exam for completeness.
- You are allowed to use a hand written sheet of paper (8x11 in), back and front.
- Calculator : TI 30 XIIS.
- Justify all your answers and show your work for credit.
- All answers must be exact, no rounding.
- Each problem is worth 10 points.

Do not open the test until everyone has a copy and the start of the test is announced.

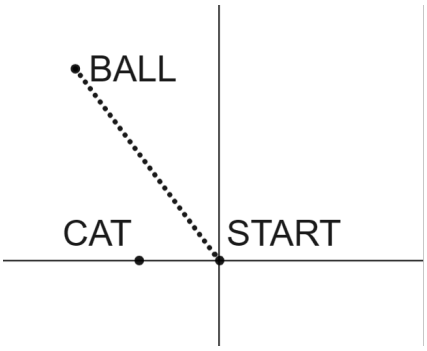
GOOD LUCK!

**Problem 1.** A company produces cellphone cases. The production cost follows a **quadratic function model**.
Production cost of 1 box of cellphone cases is \$4.50 while the cost of 5 boxes of cellphone cases is \$12.50. Because of fixed costs, the production of 0 boxes of cellphone cases is \$7.50.

(a) Write the function $f(x)$ of the production cost, where $x$ is the number of boxes of cellphone cases. Put a box around your final answer.

(b) How many boxes of cellphone cases should the company produce to minimize production costs? Put a box around your final answer.

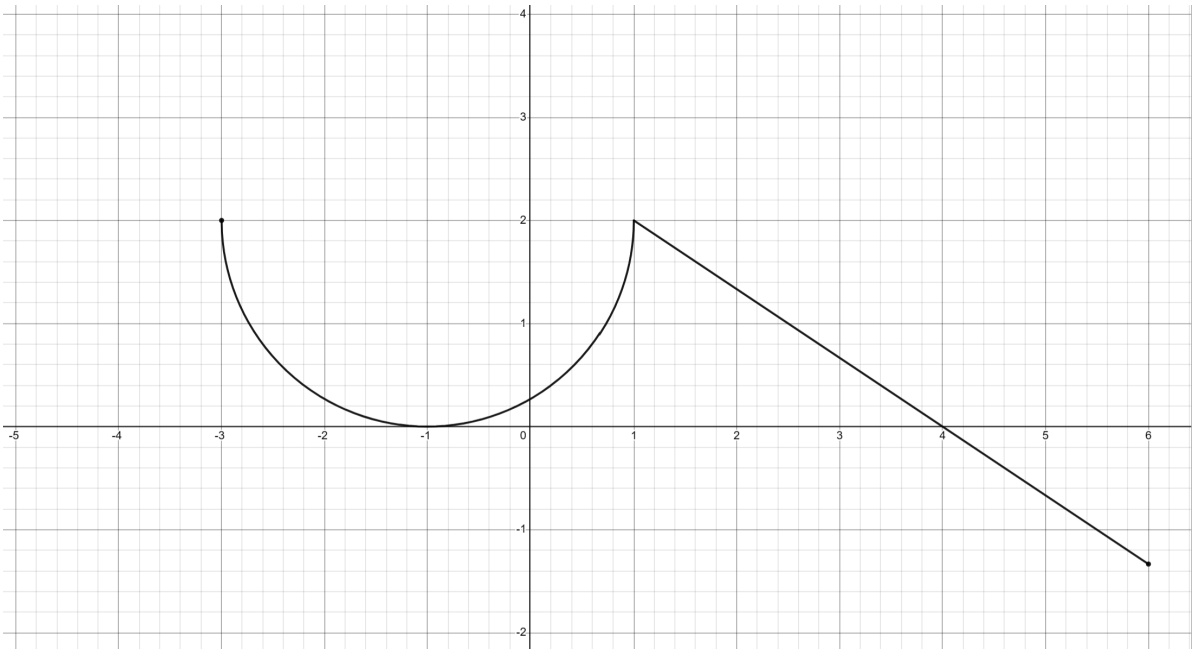
**Problem 2.** A Black Labrador dog is running on a straight line with the same speed to retrieve a ball. The ball is located 90m west and 120m north of the dog's starting point. The dog starts running when $t = 0$ and reaches the ball 15 seconds later. Do not round in this problem.




(a) Find the parametric equations of the dog's motion. Put a box around your final answer.

(b) When will the dog be due north of a cat who lies 50 m west of the Black Lab's starting point? Put a box around your final answer.

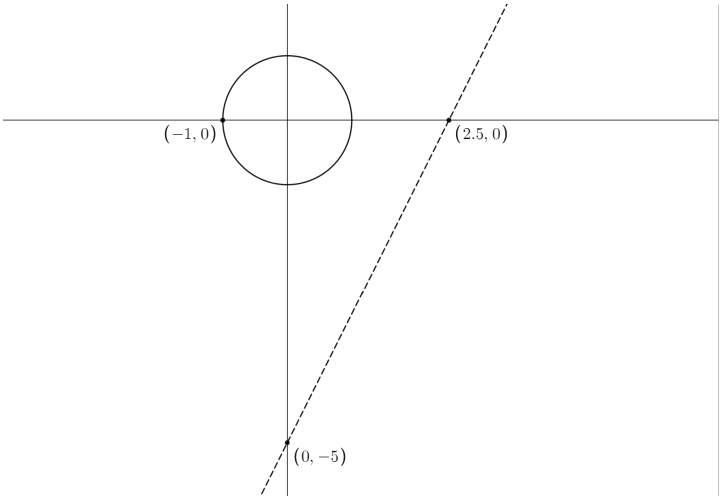
**Problem 3.** (a) Find the multipart function $f(x)$ whose graph is shown below.




(b) What is the range of the function in interval notation?

(c) Find the point(s) of intersection of $f(x)$ from (a) with the function $g(x) = -1$ through algebra.

**Problem 4.** On a circular island of diameter 2km, a Person is stranded. A boat passes by the island on a straight line 5km due south of the island center and a little later 2.5km due east of the island center (see sketch).




(a) Where should the Person stand on the island to be closest to the boat when it passes? Find the coordinates, do not round. Put a box around your final answer.

(b) Can the Person draw the boat's attention by shouting from the center of the island if the sound is carried 2.2km?