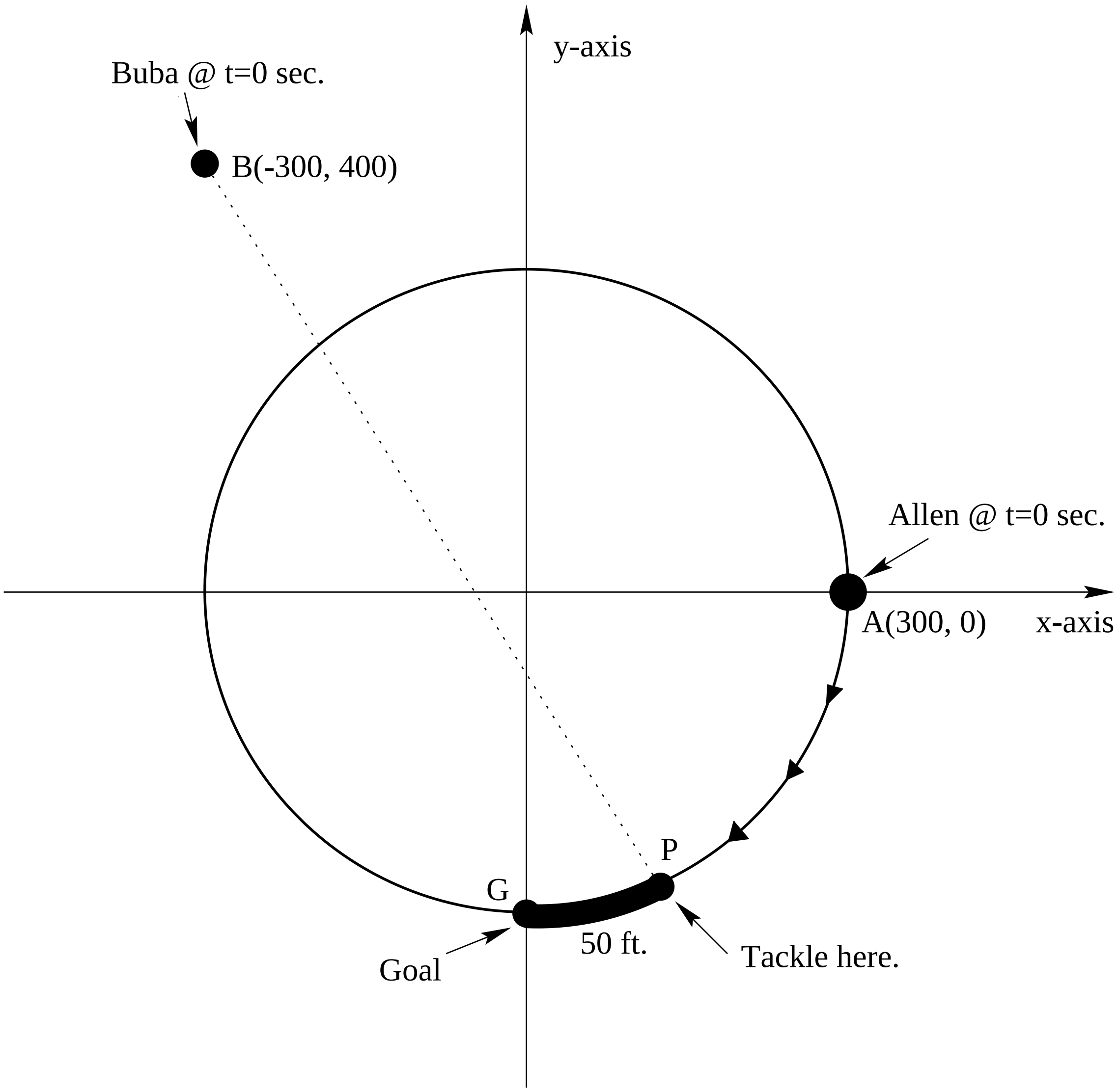
Instructions:

1. You have 50 minutes for this midterm exam. Show **all** your work. No credit will be given for answers only.
2. Put your **name, student identification number**, and **section** on each page of this exam.
3. Scientific or graphing calculators are allowed. Laptop computers are **not** allowed.
4. One $8\frac{1}{2}''$ x $11''$ sheet with notes on both sides is allowed.
5. When you are done, please hand your exam in to your teaching assistant.

Scores		
Problem	**Possible**	**Earned**
1	**30**	
2	**20**	
3	**30**	
4	**20**	
Total	**100**	

Problem #1:

Allen drives a soccer ball toward the goal **G** along a circular path of radius $r = 300\,\mathrm{ft}$. At $t = 0\,\mathrm{sec}$, Allen starts running in a clockwise direction from $A(300, 0)$ with an angular speed of $\omega_A = -0.04\,\frac{\mathrm{rad}}{\mathrm{sec}}$. In the mean time, Buba starts running at $t = 0\,\mathrm{sec}$ toward **P**, a point that is an arclength of exactly $50\,\mathrm{ft}$ from the goal **G**. Buba intends to tackle Allen at the point **P**.



Please answer the questions on the next page.

Problem #1, Continued:

1.1 (15) What are the coordinates of the tackle point **P**?

1.2 (10) When must the tackle take place?

1.3 (5) How fast must Buba run to tackle Allen?

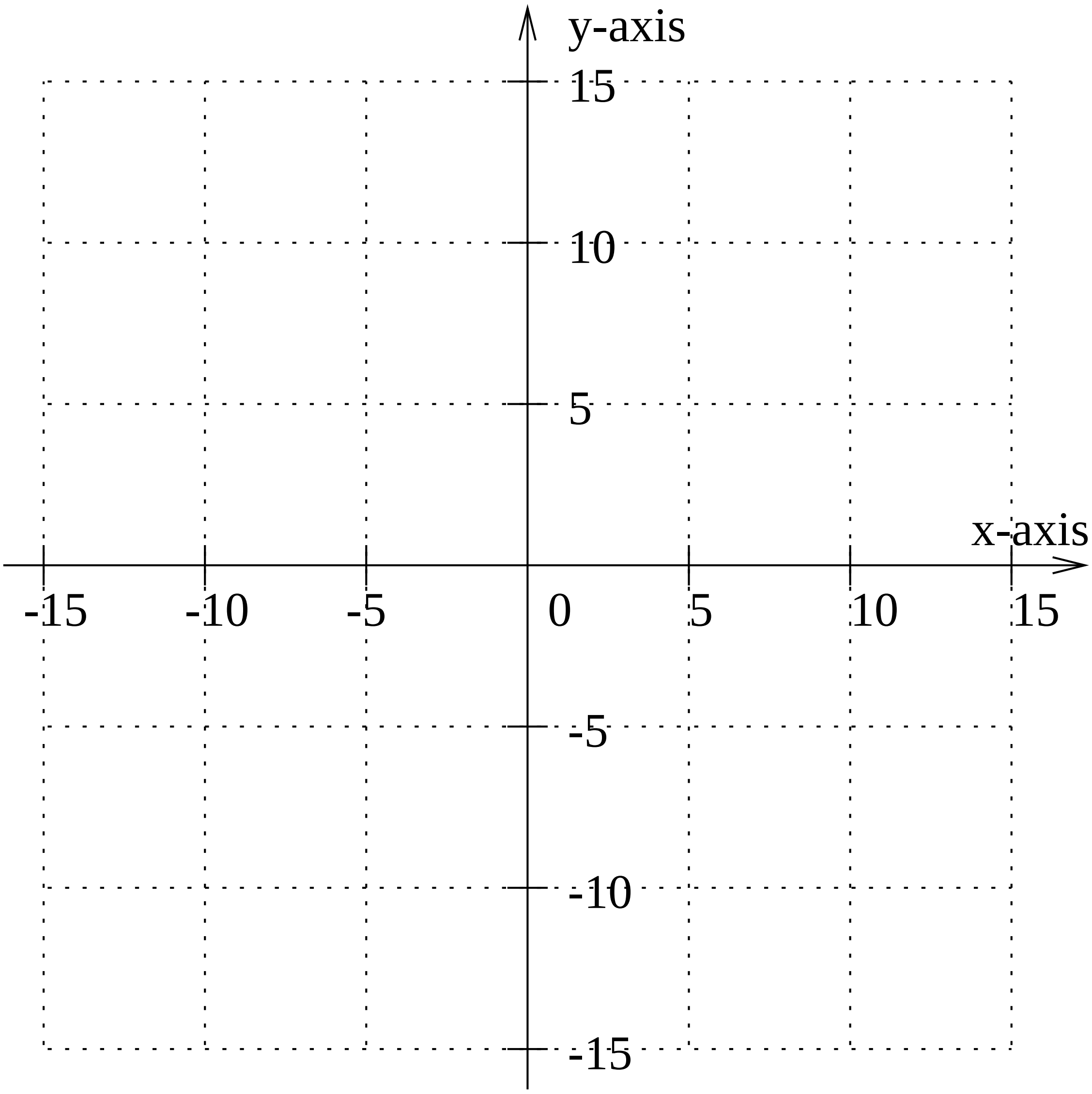
Problem #2:

2.1 (10) Let $f(x) = 2 - 2x - \frac{1}{3}x^2$. Find all the inverse functions for $y = f(x)$.

Name________________________ Id #________________ Section________

Problem #2, Continued:

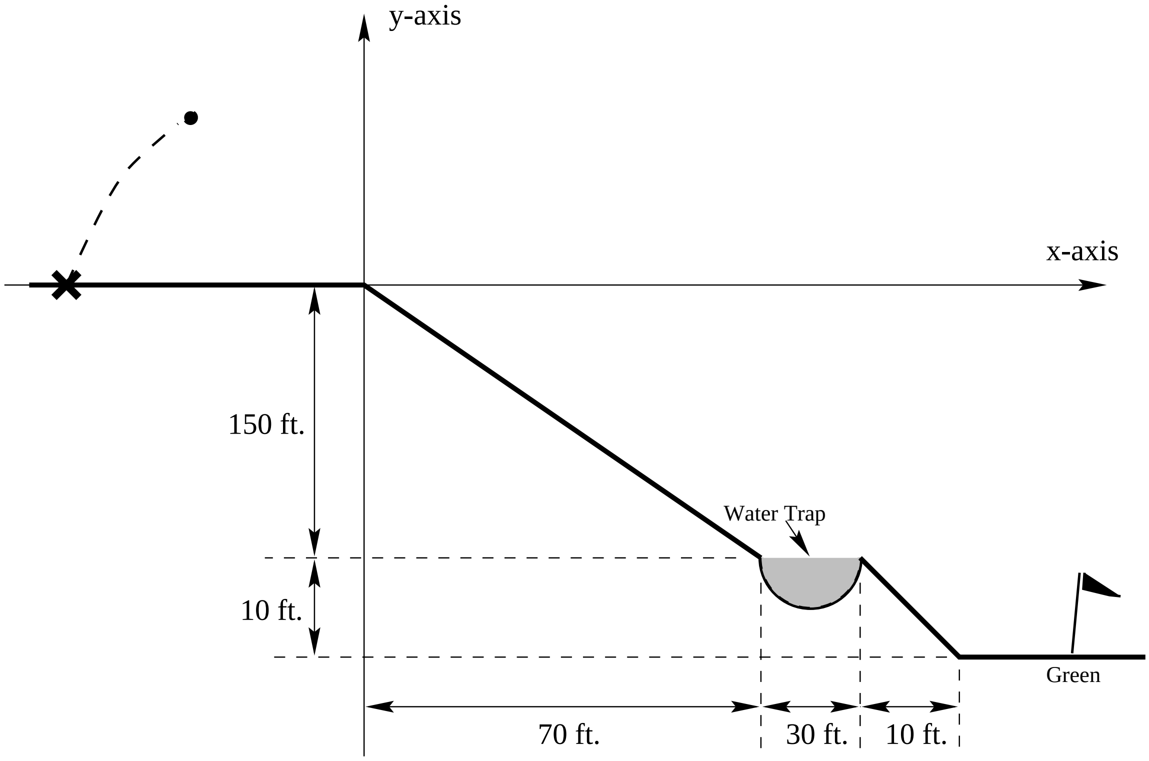
2.2 (10) Sketch and label the original function, $y = f(x)$, and its inverses in the xy–coordinate system below.



Problem #3:

Tiger Woods hits a golf ball from the spot marked **X** pictured below. The golf ball has a trajectory given by

$$T(x) = -\frac{1}{50}x^2 + \frac{1}{25}x + \frac{2,499}{50}.$$



Note: This sketch is not to scale.

3.1 (5) Where is the ball when it is first hit by Tiger Woods?

Problem #3, Continued:

3.2 (5) Where is the vertex of the ball's path?

3.3 (10) What is the maximum height of the ball above the slope where $0 \leq x \leq 70$?

3.4 (10) Does the ball land in the water trap? Explain your answer.

Problem #4:

A wire hoop for blowing soap bubbles is attached to a board. Five inches above the hoop, a sharp nail protrudes out over the hoop. At $t = 0$ sec a soap bubble droops down below the hoop, a small fan is turned on, and the fan gently expands the bubble upward. Pictured below is a cross-section showing the fan, soap bubble, the board, and the nail at $t = 0$ sec.

At $t = 0$ sec, the curved edge of the bubble's cross-section is described by

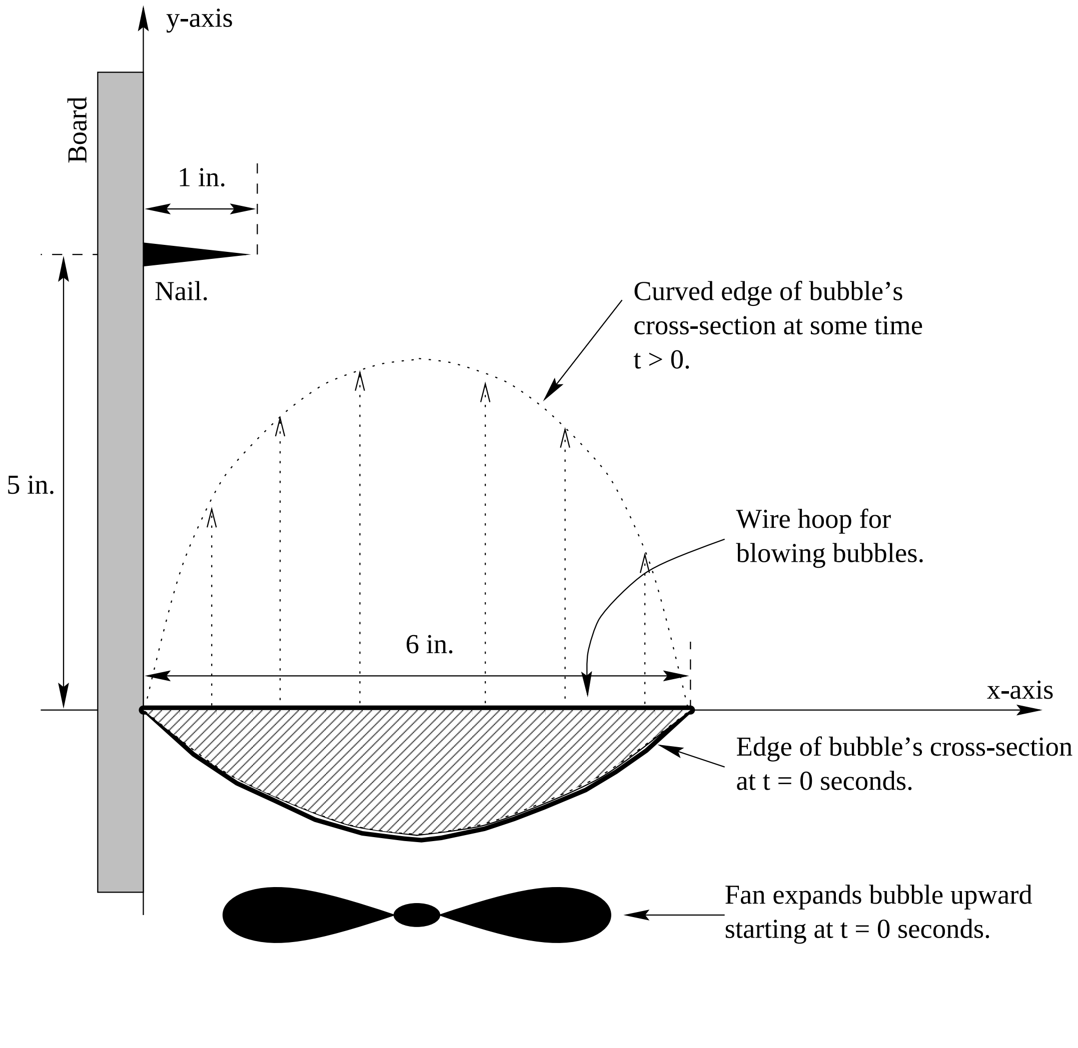
$$f(x) = \frac{2}{9}x(x-6),$$

where $0 \leq x \leq 6$.

The vertical dilation of the bubble varies with time t. At a given time t, the dilation is described by

$$c(t) = (1+t)(1-t),$$

where $t \geq 0$.



Problem #4, Continued:

4.1 (5) Briefly describe how $c(t)$ affects the shape of the bubble's cross-section.

4.2 (5) What is the bubble's cross-section at $t = 1\,\text{sec}$?

4.3 (10) As the bubble expands, it hits the nail's sharp point and bursts. When does the bubble burst?

Blank Page

Blank Page