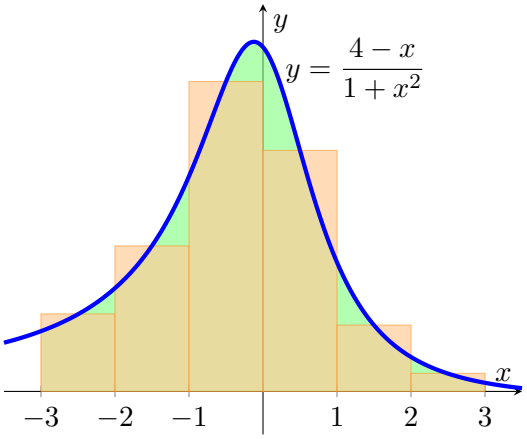
Name: _____

Instruction: You are encouraged to work on this assignment collaboratively with your peers in class. You can also ask me for hints if you are stuck. Yet you should write up your own work and submit it on Canvas in **ONE** pdf file. Show all of your work for full credit, and your work should be clearly written and organized. This homework covers some important concepts in §5.1, §5.2, and §5.3.

Problem 1. Approximate the area of the region under the curve of

$$y = \frac{4 - x}{1 + x^2}$$

by **calculating the area the area of the shaded rectangles** shown in the diagram below. Which approximation method do these rectangles represent?



Problem 2. Justify graphically with pretty pictures and explanation that

(a) If f is a continuous **odd function**, then $\displaystyle\int_{-a}^{a} f(x)\,dx = 0$.

(b) If g is a continuous **even function**, then $\displaystyle\int_{-a}^{a} g(x)\,dx = 2\int_{0}^{a} g(x)\,dx$.

Hint: Recall that

- f is an *odd* function if its graph is **symmetric across the origin**.
- g is an *even* function if its graph is **symmetric about the y-axis**.

Problem 3. Find **constants** c_1 and c_2 such that

$$F(x) = c_1 \sin(3x) + c_2 x \cos(3x)$$

is an antiderivative of $f(x) = 2x \sin(3x)$.

> **Hint:** Recall that $F(x)$ is an antiderivative of $f(x)$ **IF** $F'(x) = f(x)$. Don't try to evaluate $\int f(x)\,dx$ as we need to build up more concepts to be able to evaluate this integral. Instead, take the derivative of $F(x)$ and match it up with $f(x)$. We want to find c_1 and c_2 such that $F'(x)$ and $f(x)$ look EXACTLY the same.

Problem 4. Find f' and f using the following conditions:

$$f''(t) = t - \cos t, \qquad f'(0) = 2, \qquad f(0) = -2$$