Definitions

- A function from set A to set B is a rule that assigns each element of set A to exactly 1 element of set B.

- An even function is one where \( f(-x) = f(x) \) and an odd function is one where \( f(-x) = -f(x) \)

- Marginal cost is the rate of change of the cost function, \( C(x) \). It approximates the cost of producing one additional unit.

Questions


2. Are the following functions even, odd, or neither?

\[
\begin{align*}
  f(x) &= x^4 - x^2 \\
  g(x) &= \frac{x}{x^2 + 1} \\
  h(x) &= x^4 - 4x^3
\end{align*}
\]
3. It costs a furniture manufacturer $100 to build a quality nightstand, which they then sell for $250. They have a monthly overhead of $10,000 to operate their factory.

(a) Write a cost function, $C(x)$.

(b) How much does it cost them to produce 50 quality nightstands a month?

(c) If they are producing 50 nightstands a month, how much more would it cost to produce 1 more nightstand?

(d) What is the marginal cost in this problem?

4. In a linear cost function $C(x) = mx + b$, what represents the marginal cost? Why?
5. A fence is to be built against a brick wall to form a rectangular lot. The rectangular area is to be surrounded by fencing on three sides, and the brick wall on the fourth side. The contractor will use exactly 200m of fencing. Let the length of the brick wall be \( l \) and the width of the rectangle \( w \). Find the area of the rectangular lot as a function of \( l \), the length.

\( \text{(Hint: Draw a picture before you proceed, and recall Area = } L \times W, \text{)} \)

6. In the following questions, let \( f(x) = x^2 - 3 \).

(a) Find \( f(x + h) \).

(b) Find \( f(x + h) - f(x) \).

(c) \( \frac{f(x + h) - f(x)}{h} \)
7. The cost to rent a mid-size car is 54 dollars per day or fraction of the day. If the car is picked up in Pittsburgh and dropped off in Cleveland, there is a fixed drop-off charge of 44 dollars. Let $C(x)$ represent the cost of renting the car for $x$ days, taking it from Pittsburgh to Cleveland. Find the following:

a) Draw a graph of $C(x)$. (Hint: Your graph is piecewise linear)

b) What is the cost of renting the car for 3 days?

c) What is the cost of renting the car for 2.5 days?