I. Examples of Tangent lines

The T.L. intersects the graph once and follows the path of the graph.

The derivative, \( f'(x) \), is the slope of the tangent line at \( x \).

a. Intuitive definition of the derivative:
b. **Estimate:**

1. \( f'(-3) = 0 \)
2. \( f(-3) = 14 \)
3. \( f'(1) = -\frac{9}{2} \)
4. \( f(1) = 0 \)
5. \( f'(10) = 7 \)
6. \( f(10) = -12 \)
II. The graph of a function is shown below.

a. What is the domain of the function?
   - x-axis is all real #
   - All real #

b. What is the range of the function?
   - y coord.
   - [1, 8)
   - Bigger than or equal one.

c. Find and label the point on the graph of f(x):
   1. $f(-3) = 1$
   2. $f(-1) = 5$
The graph of a function is shown below.

II. The graph of a function is shown below.

a. What is the domain of the function?

b. What is the range of the function?

d. Estimate:

1. \( f'(-4) \approx -2 \)
2. \( f'(-3) = 0 \)
3. \( f'(-2) \approx 3 \)
4. \( f'(-1) \approx 4 \)

e. Graph \( f'(x) \).
III. The graph of a function is shown below.

\[ f(x) = \cos(x) \]

- **Period**

- **π/4**
- **π/2**
- **π**
- **2π**

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a. What is the domain of the function?

All Reals

b. What is the range of the function?

\[ \left[ -1, 1 \right] \]

c. What is the period of the function?

0 to 2π or 2π

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c. Find and label the point on the graph of \( f(x) \):

1. \( f\left(\frac{\pi}{2}\right) = 0 \)
2. \( f\left(\frac{\pi}{4}\right) \approx .7 \)
III. The graph of a function is shown below.

a. What is the domain of the function?

b. What is the range of the function?

d. What is the period of the function?

d. Estimate:

1. \( f''(0) \approx 0 \)

2. \( f''\left(\frac{\pi}{4}\right) \approx -\frac{6}{1.5} \approx -4 \)

3. \( f''(\pi) = 0 \)

4. \( f''\left(\frac{3\pi}{2}\right) \approx 1 \)

5. \( f''(2\pi) = 0 \)

e. Graph \( f'(x) \).
**A second definition of the derivative**

B. Let \( h(t) \) be the function for altitude (in feet) and \( V(t) \) be the vertical velocity (in feet per second):

\[
h(t) = h_0 + V_0t - 16t^2 \quad V(t) = V_0 - 32t
\]

Could a major league pitcher throw the ball to the 195 foot ceiling of the Metrodome in Minnesota? (Assume \( V_0 = 100 \text{ ft/sec} \))

1. From what height was the ball thrown?
2. What was the balls initial velocity? Was the ball thrown up or down? How can you tell?
3. Was the ball increasing or decreasing at time \( t = 2 \)?
4. At what time did the ball reach its maximum height? How high was it then?