1 5.1: Graphical Interpretation of \( f, f', \) and \( f'' \)

**Graphical Interpretations of \( f' \):**

If \( f'(x) > 0 \) for all \( x \in (a, b) \) then \( f \) is

If \( f'(x) < 0 \) for all \( x \in (a, b) \) then \( f \) is

**Example:** Draw a function \( f \) from \((1,0)\) to \((4,5)\) with \( f' > 0 \):

**Definitions:**

a differentiable function \( f \) is **concave up** on an interval \((a, b)\) if and only if

a differentiable function \( f \) is **concave down** on an interval \((a, b)\) if and only if

**Therefore...**

If \( f''(x) > 0 \) for all \( x \in (a, b) \), then

If \( f''(x) < 0 \) for all \( x \in (a, b) \), then
On Beyond Average: Sketch the graph of a continuous function which satisfies the following:

- \( f'(x) < 0 \) for \( x \in (-1, 1) \)
- \( f'(x) > 0 \) for \( x \in (-\infty, -1) \cup (1, \infty) \)
- \( f(-1) = 4, f(1) = 0 \)
- \( f''(x) < 0 \) for all \( x \neq 1 \)