1 5.3: Derivatives and the Shape of Curves

Mean Value Theorem:

**Recall 5.1:** What $f'$ and $f''$ say about $f$:

Second Derivative Test:

**Examples:**

Determine when the function $f(x) = 2x^4 + 8x^3 + 4$ is increasing, decreasing, concave up, and concave down.
Determine when the function $f(x) = \ln(x^2 + 4x + 5)$ is increasing, decreasing, concave up, and concave down.
On Your Own:

Determine where the function \( f(x) = 2 \cos x - \frac{1}{2} \cos(2x) \) is increasing, decreasing, concave up, and concave down on the interval \( 0 \leq x \leq 2\pi \).

increasing \((\pi, 2\pi)\); decreasing \((0, \pi)\); concave up \(\frac{\pi}{3}, \frac{5\pi}{3}\); concave down \((0, \frac{\pi}{3}) \cup (\frac{5\pi}{3}, 2\pi)\).