

**Problem Definition**

Problem 29. Compute the value of the derivative of the given function at the given point.

$$f(x) = -\frac{1}{2}x(1 + x^2) \quad (1, -1)$$

**Solution Step 1:**

To start this problem, let's expand the polynomial before computing the derivative. The function can be rewritten as

$$f(x) = -\frac{1}{2}x - \frac{1}{2}x^3$$

**Solution Step 2:**

Now, we can use the power rule on each of the terms to compute the derivative of our function. That is,

$$\begin{aligned} f'(x) &= \frac{d}{dx}\left(-\frac{1}{2}x\right) + \frac{d}{dx}\left(-\frac{1}{2}x^3\right) \\ &= -\frac{1}{2}\frac{d}{dx}(x) - \frac{1}{2}\frac{d}{dx}(x^3) \\ &= -\frac{1}{2}(1) - \frac{1}{2}(3x^2) \\ &= -\frac{1}{2}(1 + 3x^2) \end{aligned}$$

**Solution Step 3:**

Now set  $x = 1$  in the expression for the derivative to obtain

$$f'(1) = -\frac{1}{2}(1 + 3(1)^2) = -\frac{1}{2}(4) = -2$$