

1. Find the derivative

$$f(x) = \frac{1}{4} \sin^2(2x)$$

2. Find the  $\frac{dy}{dx}$  by implicit differentiation

$$x^2y + y^2x = -2$$

3. Find the absolute extrema of the function on the closed interval

$$f(x) = \sqrt[3]{x}, [-8, 8]$$

- 4.

$$f(x) = \begin{cases} 4 - x^2, & x \leq 0 \\ -2x, & x > 0 \end{cases}$$

- (a) Find the critical numbers of  $f$
- (b) Find the open intervals on which the function is increasing or decreasing
- (c) Apply the First Derivative Test to identify all relative extrema