

### Problem Definition

Problem 23. Find the given value.

$$f(x) = \sqrt{4-x} \quad f'''(-5)$$

### Solution Step 1:

The first step is to compute the first, second, and third derivatives to get to the appropriate derivative for evaluation. The needed derivatives come from the following calculations

$$\begin{aligned} f'(x) &= \frac{d}{dx} \sqrt{4-x} = \frac{d}{dx} (4-x)^{\frac{1}{2}} \\ &= \frac{1}{2} (4-x)^{-\frac{1}{2}} (-1) \\ &= -\frac{1}{2} (4-x)^{-\frac{1}{2}} \\ f''(x) &= \frac{d}{dx} \left( -\frac{1}{2} (4-x)^{-\frac{1}{2}} \right) \\ &= \frac{1}{4} (4-x)^{-\frac{3}{2}} (-1) \\ &= -\frac{1}{4} (4-x)^{-\frac{3}{2}} \\ f'''(x) &= \frac{d}{dx} \left( -\frac{1}{4} (4-x)^{-\frac{3}{2}} \right) \\ &= \frac{3}{8} (4-x)^{-\frac{5}{2}} (-1) \\ &= -\frac{3}{8} (4-x)^{-\frac{5}{2}} \end{aligned}$$

### Solution Step 2:

With the third derivative available we can evaluate this function at

$$f'''(-5) = -\frac{3}{8} (4 - (-5))^{-\frac{5}{2}} = -\frac{3}{8} (9)^{-\frac{5}{2}} = -\frac{1}{648}$$