4.1 Increasing and Decreasing Functions

A Increasing and Decreasing Functions

A function \( f \) is \textit{increasing} over the interval \((a, b)\) if \( f(x_1) < f(x_2) \) whenever \( x_1 < x_2 \) in the interval \((a, b)\).

A function \( f \) is \textit{decreasing} over the interval \((a, b)\) if \( f(x_1) > f(x_2) \) whenever \( x_1 < x_2 \) in the interval \((a, b)\).

A function \( f \) is \textit{constant} over the interval \((a, b)\) if \( f(x_1) = f(x_2) \) for every \( x_1 \) and \( x_2 \) in the interval \((a, b)\).

B Test for Intervals of Increase or Decrease

Let \( y = f(x) \) be a differentiable function over \((a, b)\). Then:

If \( f'(x) > 0 \) for all \( x \in (a, b) \) then \( f \) is \textit{increasing} over \((a, b)\).

If \( f'(x) < 0 \) for all \( x \in (a, b) \) then \( f \) is \textit{decreasing} over \((a, b)\).

If \( f'(x) = 0 \) for all \( x \in (a, b) \) then \( f \) is \textit{constant} over \((a, b)\).
Ex 3. Find the intervals of increase or decrease for \( f(x) = \frac{2}{x} - \frac{1}{x^2} \).

Ex 4. Find the intervals of increase or decrease for \( f(x) = \frac{x}{x^2 + 1} \).

Ex 5. Find the intervals of increase or decrease for \( f(x) = (x - 2)\sqrt[3]{x^2} \).

Reading: Nelson Textbook, Pages 165-169
Homework: Nelson Textbook: Page 169 #1cd, 3bc, 5, 7, 8, 11