

Chapter 4 (4.3)

Increasing/ Decreasing test

- (a) If $f'(x) > 0$ on an interval I , then f is increasing on that interval.
- (b) If $f'(x) < 0$ on an interval I , then f is decreasing on that interval.

Examples:

A. $f(x) = e^{x^3+2x}$ is increasing on \mathbb{R} since $f'(x) = (3x^2 + 2)e^{x^3+2x} > 0$ for all $x \in \mathbb{R}$.

B. $f(x) = \frac{1}{e^{x+1}}$, then

- $f(x)$ is increasing on \mathbb{R}
- $f(x)$ is decreasing on \mathbb{R}
- $f(x)$ is not monotonic¹
- $f(x)$ is increasing on $(-\infty, -1)$

Solution of B:

Since $f'(x) = \frac{-e^x}{(e^{x+1})^2} < 0$ for all $x \in \mathbb{R}$, then the answer is b.

¹ Monotonic means increasing or decreasing.