

§3.3: First Derivative Test

“I WILL ...

...apply the First Derivative Test to functions.”

I. Definitions

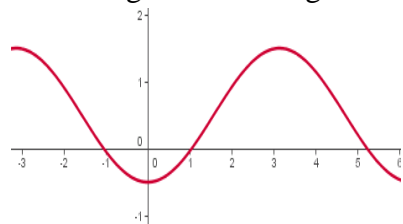
A. First Derivative Test is to find the intervals of increasing or decreasing and located any relative extrema

1. If $f'(x) > 0$, then f is _____
2. If $f'(x) < 0$, then f is _____

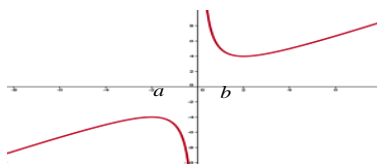
B. _____ Point/_____ Value can tell us whether we have a relative minimum or relative maximum when the derivative is equal to _____ or _____.

1. If f' changes signs from positive to negative, then it is a _____
2. If f' changes signs from negative to positive, then it is a _____

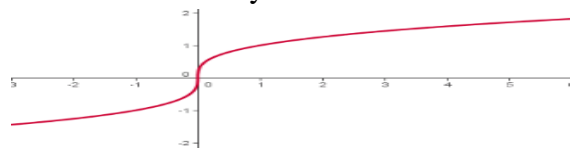
Ex 1: Identify the intervals where function is increasing or decreasing.



Ex 2: Identify the intervals where function is increasing or decreasing.



Your Turn: Identify the intervals where function is increasing or decreasing.



II. Identifying Increasing and Decreasing Function

A. Find the Critical Numbers by taking the derivative and write intervals

B. Substitute a value from each interval into to test it

C. Indicate how the function behaves (Let f be a function that is continuous on the closed interval $[a, b]$ and differentiable on the open interval (a, b))

1. If $f'(x) > 0$ for all x in (a, b) , then f is _____ on $[a, b]$
2. If $f'(x) < 0$ for all x in (a, b) , then f is _____ on $[a, b]$
3. If $f'(x) = 0$ for all x in (a, b) , then f is _____ on $[a, b]$

D. Apply to the ORIGINAL function to establish the maximums and minimums

E. Make sure to justify reasoning with explanations and math symbols/definitions

Ex 3: Find the open intervals on which $f(x) = x^2 + 8x + 10$ is increasing or decreasing and locate any relative extrema.

Ex 4: Find the open intervals on which $f(x) = x^3 - \frac{3}{2}x^2$ is increasing or decreasing and its extrema.

<p>Ex 5: Find the open intervals on which $f(x) = \frac{x+3}{x^2}$ is increasing or decreasing and locate any relative extrema.</p>	<p>Your Turn: Find the open intervals on which $f(x) = x^3 - 6x^2 + 15$ is increasing or decreasing and its extrema.</p>	
<p>Ex 6: Find the open intervals from $[0, 2\pi]$ on which $f(x) = \cos x - 1$ is increasing or decreasing and its extrema.</p>	<p>Your Turn: Find the open intervals from $(0, 2\pi)$ on which $f(x) = \frac{x}{2} - \sin x$ is increasing or decreasing and its extrema.</p>	
<p>AP 1) The function f is given by $f(x) = x^4 + x^2 - 2$. On which of the following intervals is f increasing? (A) $(-\frac{1}{\sqrt{2}}, \infty)$ (B) $(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$ (C) $(0, \infty)$ (D) $(-\infty, 0)$</p>		
<p>Vocabulary</p>	<p>Connections and Process</p>	<p>Answer and Justifications</p>