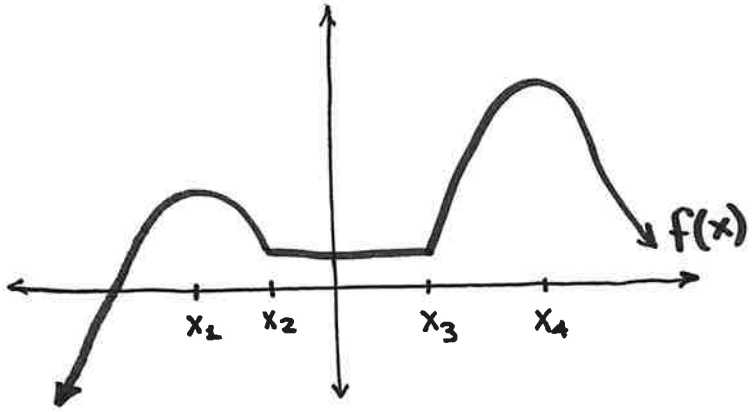
# MATH 1325
## Chapter 12.1: Local Extrema

INCREASING

DECREASING

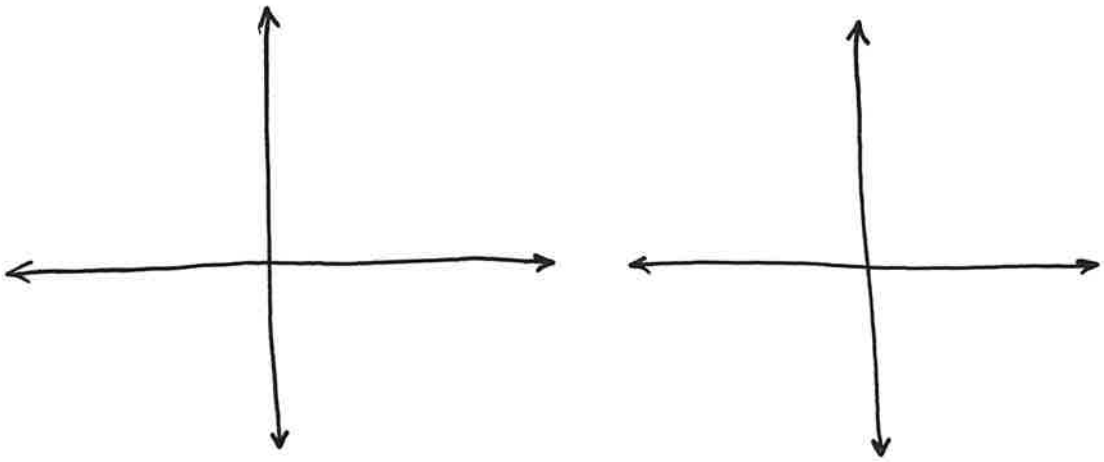
CONSTANT




IF $f(x)$ HAS A DERIVATIVE AT EACH POINT IN AN OPEN INTERVAL...

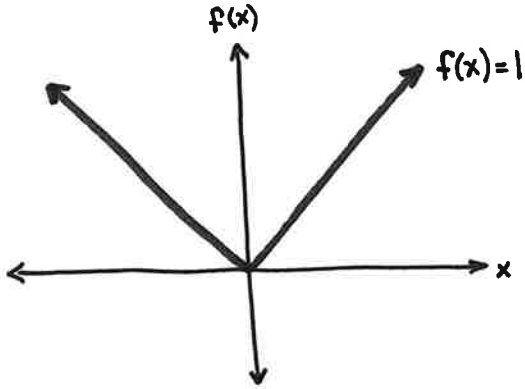
$f'(x) > 0$ $\qquad$ $f'(x) < 0$ $\qquad$ $f'(x) = 0$

FIND THE INTERVALS ON WHICH $f(x) = x^3 + 3x^2 - 9x + 4$ IS INCREASING, DECREASING, AND CONSTANT.



## CRITICAL NUMBER:

A NUMBER C IS A CRITICAL NUMBER OF $f(x)$ WHEN $f(c)$ EXISTS AND $f'(c) = 0$ OR $f'(c)$ DOES NOT EXIST.




$f(x) = |x|$

## INCREASING / DECREASING TEST FOR $f(x)$:

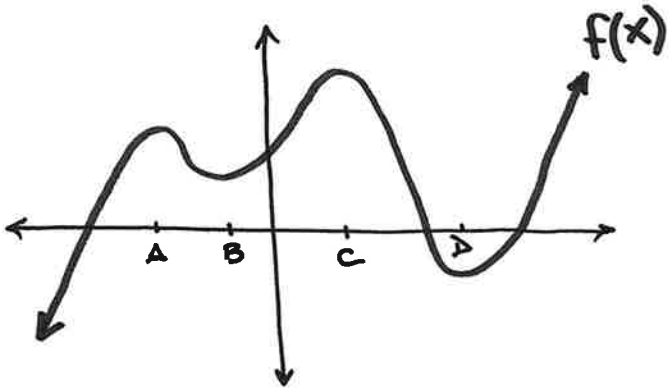
FIND $f'(x)$.
FIND THE CRITICAL NUMBERS.
FIND WHERE $f'(x) > 0$ (INCREASING) AND $f'(x) < 0$ (DECREASING).

FIND WHERE $f(x) = x^2 + 6x$ IS INCREASING AND DECREASING.

## LOCAL EXTREMA

LOCAL MAXIMUM

LOCAL MINIMUM



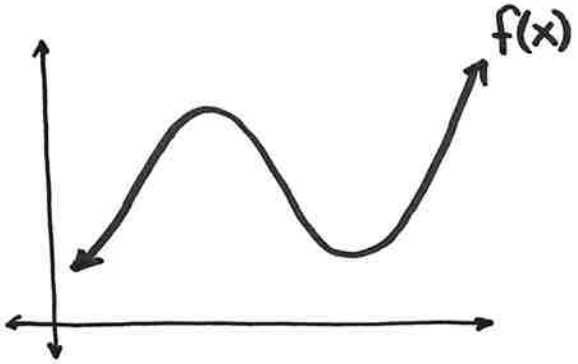

FIND THE CRITICAL NUMBERS OF $f(x) = 2x^3 - 3x^2 - 72x + 15$.

FIND THE CRITICAL NUMBERS OF $f(x) = x^3$.

Find the critical numbers of $f(x) = \sqrt[3]{x^2}$.

Find the critical numbers of $f(x) = 3x^{4/3} - 12x^{1/3}$.

## First Derivative Test




$a < c < b$

$f'(a) > 0 \quad f'(b) < 0$ c: local max

$f'(a) < 0 \quad f'(b) > 0$ c: local min

$f'(a)$ and $f'(b)$ have same sign — c: no local extrema

Find the local extrema of $f(x) = 2x^3 - 3x^2 - 72x + 15$.