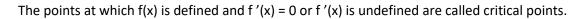
# PDF 4.020 Critical Points, Local Maxima and Local Minima

<u>First Derivative Test</u>	
If $f'(x)$ goes from positive to 0 to negative, then there is a local maximum at the point where $f'(x) = 0$	Similarly, if $f'(x)$ goes from positive to undefined to negative, and if $f(x)$ is defined at the point where $f'(x)$ is undefined, then there is a local maximum at the point where $f'(x) = 0$
If $f'(x)$ goes from negative to 0 to positive, then there is a local minimum at the point where $f'(x) = 0$	Similarly, if $f'(x)$ goes from negative to undefined to positive, and if $f(x)$ is defined at the point where $f'(x)$ is undefined, then there is a local minimum at the point where $f'(x) = 0$
If $f'(x)$ goes from positive to 0 to positive, then there is neither a maximum nor a minimum.	If f '(x) goes from negative to 0 to negative, then there is neither a maximum nor a minimum.

Critical	<b>Points</b>	and	Critical	<b>Numbers</b>
Critical	PUIILS	anu	Critical	numbers



The values of x at which f'(x) = 0 or f'(x) is undefined are called critical numbers.

#### Example 1

For the function  $y = x^4 - 8x^3 + 18x^2$ , determine all the critical points. Determine whether each of these values of x gives a local maximum, a local minimum or neither.

#### Example 2

Determine whether the function  $f(x) = x^3$  has a maximum or a minimum or neither at (c, f(c)) where f'(c) = 0.

#### Example 3

Determine the critical numbers for the function  $y = \sqrt{x^2 - 4x + 8}$  and determine whether each one represents a local maximum, a local minimum, or neither.

## Example 4

Determine the critical numbers for  $y=(x+3)^{\frac{1}{3}}$  and then determine whether each critical number represents a maximum or a minimum or neither.

## Example 5

Determine the critical numbers for  $y=(x+3)^{\frac{2}{3}}$  and then determine whether each critical number represents a maximum or a minimum or neither.

# Example 6

Determine the values of a, b and c such that  $f(x) = ax^2 + bx + c$  has a local maximum at (5, 6) and passes through (8, -12).

# Example 7

Given the curve of y = f(x) shown below, graph the curve y = f'(x)

