

## 20 – Finding Max's & Min's

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**Theorem: Local Extrema Theorem**

If  $f$  has a local max or min at  $x = c$ , then  $f'(c) = 0$  or  $f'(c)$  DNE.

**Definition: Critical Number**

We say that  $c$  is a **critical number** of  $f$  if  $c$  is in the domain of  $f$  and either  $f'(c) = 0$  or  $f'(c)$  DNE.

1. Find the critical numbers of each of the following.

(a)  $f(x) = 2x^3 - 3x^2 - 36x$

(b)  $g(x) = 3x^{\frac{2}{3}} - x$

### Strategy: Finding Absolute Extrema

Suppose you want to find the absolute extrema of  $f$  on an interval  $I$ .

1. Find all critical numbers of  $f$  in  $I$ .
2. Compute
  - the value of  $f(c)$  for every critical number  $c$  and
  - the values of  $f$  at the endpoints of  $I$ .

The largest value is the absolute max and the smallest is the absolute min.

2. Find the absolute extrema of  $f(x) = x^2e^{-3x}$  on  $[-1, 1]$ .