MATH 2D Prep: Local Extreme Values

Facts to Know:

For simplicity, we assume all functions in this script are continuous and differentiable everywhere.

1. Critical numbers: $x = c$ is a critical number of the function $f(x)$ if _____ .

2. First derivative test: Suppose c is critical number of $f(x)$

   - If f' changes from positive($+$) to negative($-$), then f has a local _____ at c,

   - If f' changes from $-$ to $+$, then f has a local _____ at c,

   - If f' is $+$ to the left and right of c, or $-$ to the left and right of c, then f has

     _____ at c,

3. Second derivative test: If $f'(c) = 0$ and

   - $f''(c) > 0$, then f has a local _____ at c,

   - $f''(c) < 0$, then f has a local _____ at c,

   - $f''(c) = 0$, then _____ .

Example:

1. Find all local extreme values of $f(x) = x^3 - 3x$.

   - Find critical numbers:

   - Method 1: First derivative test:

Inteval	$f'(x)$	$f(x)$

   - Method 2: Second derivative test:

     $f''(x) =$

x	$f''(x)$	$f(x)$