1. Last time we saw that as a consequence of the Mean Value Theorem, for a differentiable function $f(x)$:

   if $f'(x) > 0$ then the functions is ...

   if $f'(x) < 0$ then the functions is ...

   Based on this observation, we can formulate the **First Derivative Test** (p. 239 in Thomas):
   If c is a critical point of a differentiable function and :

   - if $f'(x)$ changes from negative to positive at c, then c is
   - if $f'(x)$ changes from positive to negative at c, then c is
   - if $f'(x)$ does not change sign at c, then c is

2. Let us see an application of the First Derivative Test
   (a) Consider the function $f(x) = x^3 - 5x^2 + 8x - 4$.
      i. What are the critical points?

      ii. On what intervals is $f(x)$ increasing or decreasing?

      Discuss here why the intervals should be open and not closed.

      iii. What are the local maxima and minima of $f(x)$ (if they exist)? Give their coordinates.

iv. What are the global maxima and minima of $f(x)$ (if they exist)? Give their coordinates.

(b) Same questions but for $f(x)$ defined on the interval $[-3, 3]$.
What changes and what remains the same?

We now have global min and max.

Look in the TeX file for the next case and add it if you find it interesting.