First derivative test for relative extrema

Suppose f is continuous on the interval (a, b). Also suppose that f is differentiable on (a, b), except possibly at some isolated points.

- If $f'(x)$ changes from negative to positive at a critical number c, then $f(c)$ is a relative minimum.

- If $f'(x)$ changes from positive to negative at a critical number c, then $f(c)$ is a relative maximum.

- If $f'(x)$ has the same sign on both sides of a critical number c, then $f(c)$ is neither a relative minimum nor a relative maximum.

Finding intervals on which f is increasing/decreasing

Suppose that f is continuous on the interval I. Also suppose that f is differentiable inside I, except possibly at some isolated points. We use the following steps to find the relative extrema and open intervals on which f is increasing/decreasing.

1. Determine domain endpoints (if any) and all points at which $f'(x)$ is zero or not defined.

2. Draw a number line and mark the points found in step 1. (Indicate which are critical numbers.)

3. Determine the sign of $f'(x)$ on each interval along your number line.

4. List open intervals on which f is increasing/decreasing.

5. Identify and list all relative extrema, including both $x-$ and $y-$coordinates.