## Section 3.1 (Extrema on an Interval)

Examine the graphs below and locate the extrema (maxima and minima) on the given intervals...



What are the derivatives at these extrema?

A *relative* or *local maximum* (*minimum*) at (c,f(c)) means there is an *open* interval containing c (not an endpoint) on which f(c) is a maximum. How is a relative maximum different that an absolute minimum?

Let f be a function defined at c. If f'(c) = 0 or if f is not differentiable at c, then c is a *critical number* of f

Finding extrema of a continuous function f on closed interval [a,b]...

- 1. Find the critical numbers on (a,b)
- 2. Evaluate f at each critical number on (a,b) and at endpoints a and b
- 3. The least is the minimum on the interval, the greatest is the maximum

<u>Example</u>: Find the extrema of  $y = x^3 - 4x^2$  on the interval [-2,5]

<u>Example</u>: Find the extrema of  $f(x) = 2x - 3x^{2/3}$  on the interval [-1,3]

<u>Example</u>: Find the extrema of  $f(x) = 2\cos(x) + \cos(2x)$  on the interval  $[0,2\pi]$