

Critical points and optimization

Math 1A, section 103

March 18, 2014

0. (Warmup.) Find the minimum value of the function $f(x) = x^2$.
1. Find the values of x at which the following functions have a critical point.
 - (a) $f(x) = 2x^3 - 3x^2 - 36x$
 - (b) $g(t) = 1 + t^2 + t^3 + t^4$
 - (c) $f(x) = 2 \cos(x) + \sin^2(x)$
 - (d) $g(t) = |3t - 4|$
 - (e) $h(p) = \frac{p-1}{p^2+4}$
2. Find all local and absolute maxima and minima of the following functions on the given intervals. Where is the function increasing? Where is it decreasing?
 - (a) $f(x) = x^3 - 6x^2 + 5$, $[-3, 5]$
 - (b) $f(x) = (x^2 - 1)^3$, $[-1, 2]$
 - (c) $f(x) = x - \ln x$, $[1/2, 2]$
 - (d) $f(t) = t\sqrt{4 - t^2}$, $[-1, 2]$
3. Where is the function $f(x) = x^3 + x$ concave up? Concave down?
4. Use the Mean Value theorem to show that $|\sin(a) - \sin(b)| \leq |a - b|$ for all a and b .