

MATH 100 – WORKSHEET 25
MINIMA AND MAXIMA

1. MINIMA AND MAXIMA BY HAND

- (1) Find the absolute maximum and minimum values of $f(x) = |x|$ on the interval $[-3, 5]$.
- (2) Find the absolute maximum and minimum of $f(x) = \sqrt{x}$ on $[0, 5]$.
- (3) Read off local maxima and minima from a posted graph.

2. LOCAL MINIMA AND DERIVATIVES

Theorem. (Fermat) *If f is defined and differentiable near c (on both sides!) and has a local minimum at c then $f'(c) = 0$.*

- To find absolute maximum/minimum of a continuous function f defined on $[a, b]$:
 - Evaluate $f(c)$ at any c such that $f'(c) = 0$.
 - Evaluate $f(c)$ at any c such that $f'(c)$ may not exist.
 - Evaluate $f(a), f(b)$
 - Choose largest, smallest value
- (1) Show that $f(x) = (x - 1)^4 + 7$ attains its absolute minimum at $x = 1$.

- (2) Show that $f(x) = (x - 1)^3 + 7$ has $f'(1) = 0$ but no local minimum or maximum there.

(3) (Midterm, 2010) Find the maximum value of $x\sqrt{1 - \frac{3}{4}x^2}$ on the interval $[0, 1]$.

(4) (Final, 2011) Find the critical numbers of $f(x) = 6x^{1/5} + x^{6/5}$.

(5) (Final, 2007) Let $f(x) = x\sqrt{3 - x}$.

(a) Find the domain of f .

(b) Determine the x -coordinates of any local maxima or minima of f .