

Continuous Optimization

Midterm Exam 1

February 9, 2012

Name (print): _____

Computing ID: _____

Signature: _____

| Question | Grade |
|----------|-------|
| 1 | |
| 2 | |
| 3 | |
| Total | |

1. (10 pt) Find the **largest connected interval** on which $f(x) = 1/(1 + x^2)$ is convex.

2. (20 pt) Let $f(x, y) = x^2 + y^2 - xy$.

(a) (5 pt) Compute $\nabla f(x)$, $Hf(x)$. Is f convex? Explain your answer.

(b) (5 pt) Find the minimizer of $f(x, y)$.

(c) (5 pt) Write out the formula for the Steepest Descent method for function minimization.

(d) (5 pt) Compute one Steepest Descent iteration, starting with initial point $(x^0, y^0) = (1, 1)$.

3. (20 pt) Let $\delta > 0$, x_0 be a real number and the function $f(x)$ is defined as

$$f(x) = \frac{1}{2}(x - x_0)^2 + \delta|x|.$$

(a) (8 pt) Is f convex? Why?

(b) (12 pt) Find the global minimizer of $f(x)$.