

# MTH 377/577: Convex Optimization

## Problem set 3

Feb 29, 2024

1. Under what conditions is the local optima of a function also the global optima? Provide a formal argument.
2. Write down the dual for the following primal problem:  $\min x_1 + 2x_2 + 3x_3$  s.t.  $-x_1 + 3x_2 = 5$ ,  $2x_1 - x_2 + 3x_3 \geq 6$ ,  $x_3 \leq 4$ ,  $x_1 \geq 0$ ,  $x_2 \leq 0$ .
3. The dual function is always concave. True/False? Give a reason for your answer.
4. Solve the following optimization problem. Show all the steps:

maximize  $-(x-2)^2 - 2(y-1)^2$ , subject to:  $x + 4y \leq 3$ ,  $x \geq y$ .