

# 4113: Math Econ Midterm

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YOUR NAME:.....

YOU HAVE 1 HOUR 15 MINUTES. THERE ARE 6 PAGES AND 2  
QUESTIONS.

DO NOT FORGET TO CHECK CONSTRAINT QUALIFICATION.

THERE IS A LIST OF PROPERTIES OF PREFERENCE RELATIONS  
ON THE LAST PAGE.

THE MAXIMIZATION PROBLEM DOES HAVE SIMPLE SOLUTION.  
IF YOUR FIRST ORDER CONDITIONS GET TOO COMPLICATED  
THINK!

GOOD LUCK!

1. Solve the following problem

$$\begin{aligned} \max_{x,y,z \in \mathbb{R}} \quad & e^z xy + x + y \\ \text{s.t.} \quad & x + y + e^z \leq 2 \\ & z(x + 3y) \geq 0 \\ & x, y, z \geq 0 \end{aligned}$$





2. Consider the preference relation  $\succ$  over  $\mathbb{R}^2$  defined like this:

$$(x, y) \succ (x', y') \text{ if and only if } x > x' \text{ and } y > y'$$

a) Is  $\succ$  complete? Prove your claim.

b) Is  $\succ$  transitive? Prove your claim.

c) Is  $\succ$  reflexive or irreflexive? Prove your claim.

d) Is  $\succ$  symmetric or asymmetric? Prove your claim.

Suppose we have a binary relation  $R$  (you can use any other symbol, for example  $\succsim$ ) on the set of alternatives  $X$ . Remember that  $R \subseteq X^2$  and for  $x, y \in X$  we say that  $xRy$  is true if  $(x, y) \in R$ . Here are some definitions. You should read the statements below as follows:  $R$  is **reflexive** if for all  $x \in X$  it is true that  $xRx$ .

**reflexive** if  $xRx$

**irreflexive** if  $\neg(xRx)$

**transitive** if  $xRy$  and  $yRz \Rightarrow xRz$

**complete** if  $xRy$  or  $yRx$  or both

**symmetric** if  $xRy \Rightarrow yRx$

**asymmetric** if  $xRy \Rightarrow \neg yRx$