ECON2125/8013*
Week 3 Tutorial Questions (6/3/2015)

Semester 1 2015

***Question* 1**

Solve the following problem

$$\max_{x,y}(\min_{x,y}) f(x,y) = x^2 + y^2 \tag{1}$$

subject to

$$g(x,y) = x^2 + xy + y^2 = 3 \tag{2}$$

***Question* 2**

Consider the utility maximization problem

$$\max_{x,y} f(x,y) = xy + x + 2y \tag{3}$$

subject to

$$2x + y = m, \quad x \geq 0,\, y \geq 0 \tag{4}$$

where we have required that the amount of each good is nonnegative. Please solve this problem. (Note: Here, "m" is just a parameter defined in $\mathbb{R}$.)

***Question* 3**

Let S be any set, $A \subset S$ and $K_\lambda \subset S$ for all $\lambda \in \Lambda$, try to prove the following properties:

$$A \backslash \left(\underset{\lambda\in\Lambda}{\cup} K_\lambda \right) = \underset{\lambda\in\Lambda}{\cap} (A \backslash K_\lambda) \text{ and } A \backslash \left(\underset{\lambda\in\Lambda}{\cap} K_\lambda \right) = \underset{\lambda\in\Lambda}{\cup} (A \backslash K_\lambda)$$

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***Question* 4**

Find the composition of two functions f and g, namely, $g \circ f$, if it exists:

(1) $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = \sin(x)$, and $g : \mathbb{R} \to \mathbb{R}$ defined by $g(x) = \frac{x}{1+x^2}$.

(2) $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = 1 - x^2$, and $g : \mathbb{R}^+ \to \mathbb{R}$ defined by $g(x) = \log(x)$. (Hint: is there a composition in this case?)