Homework 1   PS 172       January 2018

1. Say that a person chooses $a$ from the choice set $A = \{0, 2, 4, 6, 8\}$ and her utility function is given by $u(a) = -5a$. Using the simple model of individual choice, what do you predict the person will choose? In other words, which $a$ in $A$ maximizes the person's utility?

2. Say that a person chooses $a$ from the choice set $A = \{0, 2, 4, 6, 8\}$ and her utility function is given by $u(a) = (a - 3)^2$. Which $a$ in $A$ is the person's optimal choice?

3. Say that a person chooses $a$ from the choice set $A = \{0, 2, 4, 6, 8\}$ and her utility function is given by $u(a) = -(a - 3)^2$. Which $a$ in $A$ is the person's optimal choice?

4. Say that a person chooses $a$ from the choice set $A = [0, 8]$ and her utility function is given by $u(a) = -5a$. Which $a$ in $A$ is the person's optimal choice?

5. Say that a person chooses $a$ from the choice set $A = [0, 8]$ and her utility function is given by $u(a) = (a - 3)^2$. Which $a$ in $A$ is the person's optimal choice? Does the first order method work?

6. Say that a person chooses $a$ from the choice set $A = [0, 8]$ and her utility function is given by $u(a) = -(a - 3)^2$. Which $a$ in $A$ is the person's optimal choice? Does the first order method work?

7. Say that a person chooses $a$ from the choice set $A = [0, 6]$ and her utility function is given by $u(a) = a^3 - 6a^2 + 12a$. Which $a$ in $A$ is the person's optimal choice? Does the first order method work?

8. Say that a person chooses $a$ from the choice set $A = [0, 4]$ and her utility function is given by $u(a) = a^3 - 9a^2 + 15a$. Which $a$ in $A$ is the person's optimal choice? Does the first order method work?

9. Say that a person chooses $a$ from the choice set $A = [0, 6]$ and her utility function is given by $u(a) = a^3 - 9a^2 + 15a$. Which $a$ in $A$ is the person's optimal choice? Does the first order method work?

10. Say that a person chooses $a$ from the choice set $A = [0, 10]$ and her utility function is given by $u(a) = a^3 - 9a^2 + 15a$. Which $a$ in $A$ is the person's optimal choice? Does the first order method work?

11. Say that two students are studying. Student 1 chooses to study $a_1$ hours and Student 2 chooses to study $a_2$ hours. Student 1 likes studying with student 2, but student 2 doesn't like studying with student 1. Hence Student 1's utility function is

   $$u_1(a_1, a_2) = (10 + a_2)a_1 - (a_1)^2$$

   but Student 2's utility function is

   $$u_2(a_1, a_2) = (10 - a_1)a_2 - (a_2)^2.$$ 

   Find the Nash equilibria of this game.