

TD – Monday, October 8, 2018

### Producer Theory

The following exercises must be submitted on Monday, October 8. A particular attention will be given to your presentation.

In both exercises, the **basic properties** of  $Y$  to be verified are the following ones:

- Possibility of inaction
- Closedness
- Impossibility of free production (“no free lunch”)
- Free-disposal
- Irreversibility
- Convexity
- Increasing/decreasing/constant returns to scale.

**Exercise 1.** A firm produces commodity 2 using commodity 1 as an input. The production function is  $f(z) = \alpha z$  with  $\alpha > 0$  and  $z \geq 0$ .

1. Determine, both formally and graphically, the production set  $Y$  which corresponds to the production function  $f$ .
2. Determine if the production  $Y$  verifies the basic properties.

Now answer questions 1) and 2) for two alternative production functions:

- $f(z) = \alpha\sqrt{z}$  with  $\alpha > 0$  and  $z \geq 0$ .
- $f(z) = \alpha(z)^2 + \beta z$  with  $\alpha > 0$ ,  $\beta > 0$  and  $z \geq 0$ .

**Exercise 2.**  $L = 3$  is the number of commodities. The firm produces commodity 3 using commodities 1 and 2 as inputs. The production function is given by

$$f(z_1, z_2) = (z_1)^\alpha (z_2)^\beta \text{ with } \alpha > 0, \beta > 0, z_1 \geq 0 \text{ and } z_2 \geq 0$$

1. Determine the production set  $Y$  which corresponds to the production function  $f$ .
2. Determine if the production  $Y$  verifies the basic properties.