Series 1.

Exercice 1

(a) Indicate the category (subtractive, replicative or additive) of each of the processes listed in Tab. 1.

(b) For the replicative processes, try to indicate the subcategories (duplicative, expendable ...).

Process	**Category**	**SubCategory**
electro discharge machining		
machining (milling, turning, ...)		
electro chemical machining		
plastic injection		
sand casting		
deep drawing		
classical sintering		
galvanic moulding		
vacuum casting		
investment casting		

Table 1: List of some production processes

Exercice 2

a) List some reasons that motivate the use of prototyping during the development phase of a product. Explain why all the prototyping steps must be fast.

b) The price of any prototype depends on different parameters. List at least five of them.

Exercice 3

You have to manufacture photoresist parts (volume $V_{\text{part}} = 250\,\text{mm}^3$ and height $H_{\text{part}} = 30\,\text{mm}$) by stereolithography. The specific characteristics of the photoresist are given below:

quantity	**symbol**	**value**	**unit**
photopolymerization energy per unit of mass	ε	17.5	[J/g]
specific price	p_{spec}	100	[Frs/kg]
density	ρ	0.8	[g/cm^3]

Table 1: Characteristics of the photoresist

The properties and characteristics of the SLA station are

quantity	**symbol**	**value**	**unit**
laser power	P	0.01	W
hourly rate	R	100	[Frs/h]
layer thickness	e	25	[μm]
recoating time (per layer)	$\tau_{\text{recoat.}}$	18	[s]
number of parts that can be made on the same base-plate	n_{plate}	25	-
price to set up the machine before starting a new batch	$p_{\text{init.}}$	200	[Frs]

Table 2: Characteristics of the SLA station

Calculate the unit cost as a function of the size N of the serie to be produced.