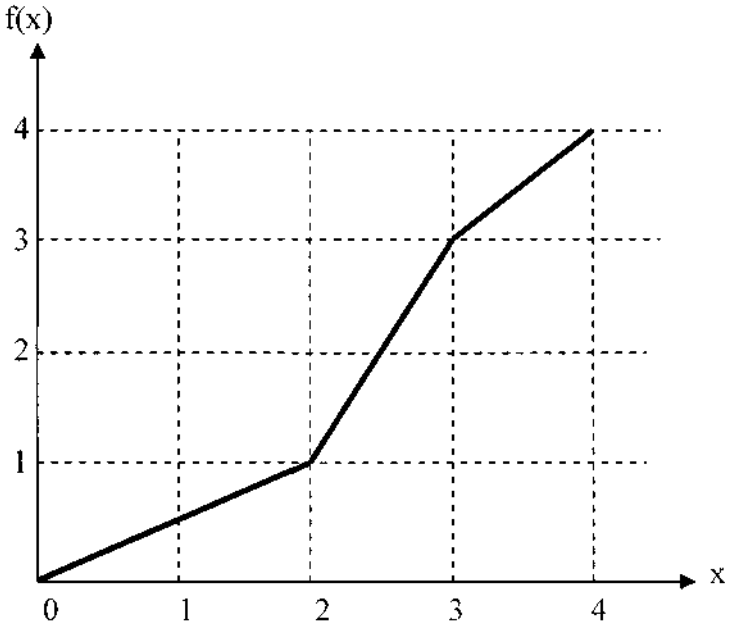
WRITTEN EXAMINATION IN OPERATIONAL RESEARCH

15.2.2012

1. While solving a maximisation linear program, how can you detect:
   a) suboptimal solution
   b) optimal solution
   c) any infeasible solution
   d) finally infeasible solution
   e) superoptimal solution
   f) unbounded solution
   g) primal degeneration
   h) degenerate iteration
   i) dual degeneration
   j) alternative optimum

(20 credits)

2. Formulate the underlying function f(x) as a separable function using binary variables:



(8 credits)

3. Describe the following terms in a manufacturing model:
   a) contribution,
   b) fixed cost,
   c) direct cost,
   d) revenue *(prihod* in Croatian),
   e) marginal value of a resource.
   f) What is the marginal value of a superfluous resource *(marginalna vrijednost resursa kojeg ima više nego što je potrebno)*

(12 credits)

4. Four tasks A, B, C, D are to be distributed on four machines. The cost for completion of every task on each machine is given.

	1	**2**	**3**	**4**
A	**9**	**2**	**1**	**5**
B	**4**	**5**	**6**	**7**
C	**2**	**1**	**3**	**6**
D	**5**	**3**	**9**	**4**

a) Solve the problem using branch & bound technique. *(5 credits)*

b) Formulate the problem as a transportation model *(5 credits)*

c) Formulate the problem as a linear program *(5 credits)*

5. Duration of activities and their prerequisites are given in the table:

Activity	**Duration [Day]**	**Prerequisites**
a	**3**	-
b	**2**	a
c	**7**	a
d	**5**	b,c
e	**4**	a
f	**6**	c
g	**1**	d,e,f

a) Find the earliest possible finish of the project if the begin was on February 15, 2012 in the morning. All the days are working days.

(5 credits)

b) Find the activities on the critical path.

(5 credits)

c) Which activity has the maximum total float and what is the value of this float?

(5 credits)