Problem 1.

```
#Add objective function:
model += (lpSum([Transp_cost_1[i][k]*X[i][k] for i in Mills for k in Warehouses]) + lpSum([Transp_cost_2[k][j]*Y[k][j] for k in Warehouses for j in Customer_areas]) + lpSum([Extra_cost[i]*Z[i] for i in Mills]), "Total_costs")
#Add capacity constraints at the mills:
for i in Mills:
  model += (lpSum([X[i][k] for k in Warehouses])<=Prod_max[i]+Z[i]*Prod_extra[i], "Capacity_at_mill_"+str(i))
#Add balance constraints at the warehouses:
for k in Warehouses:
   model += (lpSum([X[i][k] for i in Mills])==lpSum([Y[k][j] for j in Customer_areas]), "Flow_balance_at_warehouse_"+str(k))
#Add demand constraints:
for j in Customer_areas:
   model += (lpSum([Y[k][j] for k in Warehouses])==Demand[j], "Demand_at_customer_area "+str(j))
```

Problem 2.

a) $min \sum_{i=1}^{3} \sum_{j=1}^{4} d_{ij}(ax_{ij} + b)x_{ij}$

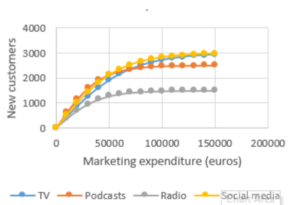
+ standard transportation problem constraints

Problem 3.

See lecture slides for the location problem and add the constraint $\min\{d_1, d_2\} \leq 80$

About 1,410,945 euros (or half of this)

Problem 4.



Objective function: $max \sum_{i=1}^{4} \left(a_i + b_i \frac{exp(c_i x_i)}{1+ exp(c_i x_i)}\right)$, optimal solutions may vary.

Problem 5.

b) busEq 76.6%; Health 23.4% Std=5.226, ER=1.5

c)