Problem 4

October 23, 2019

[1]:

```
# For the column player
from gurobipy import *

# Create new model
m = Model("problem4-1")

# Create variables (lowerbound of 0 by default)
y2 = m.addVar(vtype=GRB.CONTINUOUS, name="y2", lb=0)
y3 = m.addVar(vtype=GRB.CONTINUOUS, name="y3", lb=0)
v = m.addVar(vtype=GRB.CONTINUOUS, name="v", lb=0)

# Update the model
m.update()

# Set Objective
m.setObjective(v, GRB.MAXIMIZE)

#Add constraints
m.addConstr((y2-y3) >= v)
m.addConstr((y3-(1-y2-y3)) >= v)
m.addConstr(((1-y2-y3)-y2) >= v)

# Optimize (model is updated when we optimize)
m.optimize()

#print model status (2 is optimal)
#https://www.gurobi.com/documentation/6.5/refman/optimization_status_codes.html
print ('Model status:', m.status)

#print decision variables
for v in m.getVars():
    print (v.varName, v.x)

#print objective function value
print ('Obj:', m.objVal)
```

```
 Bounds range     [0e+00, 0e+00]
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```
  RHS range        [1e+00, 1e+00]
Presolve removed 1 rows and 1 columns
Presolve time: 0.01s
Presolved: 2 rows, 2 columns, 4 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    1.3333333e-03   4.333333e-03   0.000000e+00      0s
       1   -0.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 1 iterations and 0.02 seconds
Optimal objective -0.000000000e+00
Model status: 2
y2 0.3333333333333333
y3 0.3333333333333333
v 0.0
Obj: -0.0
```

[2]:

```python
# For the row player
from gurobipy import *

# Create new model
m = Model("problem4-2")

# Create variables (lowerbound of 0 by default)
x2 = m.addVar(vtype=GRB.CONTINUOUS, name="x2", lb=0)
x3 = m.addVar(vtype=GRB.CONTINUOUS, name="x3", lb=0)
u = m.addVar(vtype=GRB.CONTINUOUS, name="u", lb=0)

# Update the model
m.update()

# Set Objective
m.setObjective(u, GRB.MINIMIZE)

#Add constraints
m.addConstr(-x2+x3 <= u)
m.addConstr((1-x2-x3)-x3 <= u)
m.addConstr(-(1-x2-x3)+x2 <= u)

# Optimize (model is updated when we optimize)
m.optimize()

#print model status (2 is optimal)
#https://www.gurobi.com/documentation/6.5/refman/optimization_status_codes.html
print ('Model status:', m.status)

#print decision variables
```

```
for v in m.getVars():
    print (v.varName, v.x)

#print objective function value
print ('Obj:', m.objVal)
```

```
Optimize a model with 3 rows, 3 columns and 9 nonzeros
Coefficient statistics:
  Matrix range     [1e+00, 2e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 1e+00]
Presolve time: 0.01s
Presolved: 3 rows, 3 columns, 9 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    0.0000000e+00   5.000000e-01   0.000000e+00      0s
       2    0.0000000e+00   0.000000e+00   0.000000e+00      0s

Solved in 2 iterations and 0.02 seconds
Optimal objective  0.000000000e+00
Model status: 2
x2 0.3333333333333333
x3 0.33333333333333337
u 0.0
Obj: 0.0
```

[ ]:

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