BEE 4750/5750 Homework 1

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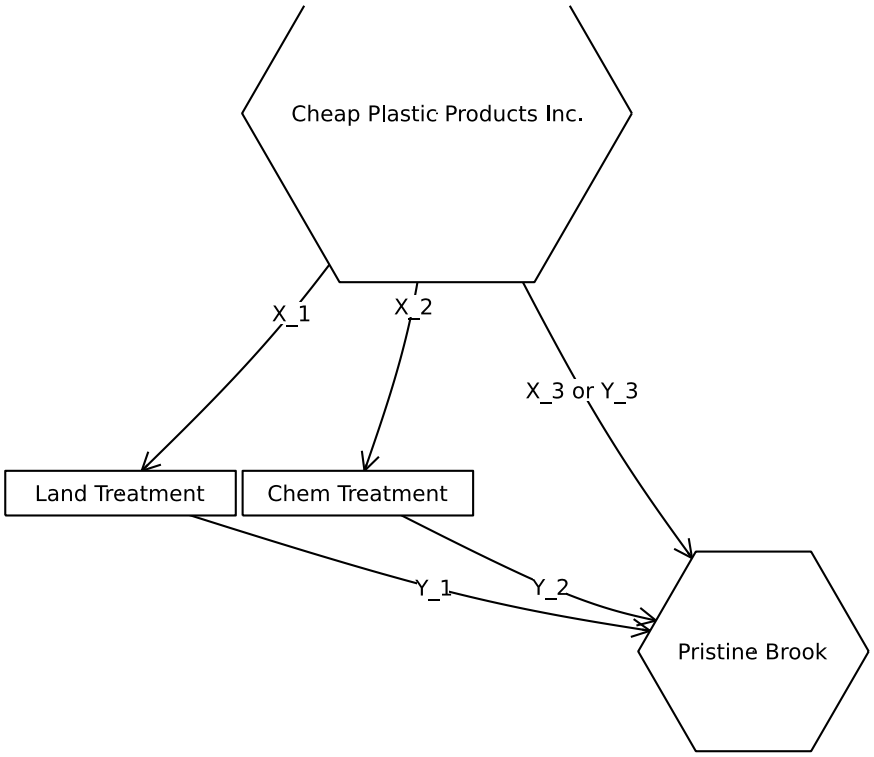
Problem 1

Problem 1.1

```
using GraphRecipes, Plots

A = [0 1 1 1;
                  0 0 0 1;
                  0 0 0 1;
                  0 0 0 0]

names = ["Cheap Plastic Products Inc.", "Land Treatment", "Chem Treatment",
"Pristine Brook"]
shapes=[:hexagon, :rect, :rect, :hexagon]
xpos = [0, -1, -0.25, 1]
ypos = [1.2, 0, 0, -0.5]
edge_labels= Dict((1,2) =>"X_1", (1,3) => "X_2", (1,4) => "X_3 or Y_3", (2,4)
=> "Y_1", (3,4) => "Y_2")
graphplot(A, names=names,  edge_label = edge_labels, markersize=0.15,
markershapes=shapes, markercolor=:white, x=xpos, y=ypos)
```



Problem 1.2

Method 1:
Cost (Dollars) : $X_1^2/c20$
Concentration Removed (kg) : $0.80 \times X_1$

Method 2:
Cost (Dollars) : $1.5 \times X_2$
Concentration Removed (kg) : $X_2 \times (1 - 0.005X_2)$

Combined:
Total Cost (Dollars) : $X_1^2/c20 + 1.5 \times X_2$
Total Remaining Concentration (kg) : $100 - 0.08X_1 - X_2(1 - 0.005X_2)$

Problem 1.3

```
function yuk(x1, x2)
                cost = (x1^2)/20 + 1.5*x2

                if cost < 0
```

```
                cost = 0
            end
            conc = 100 - x1*0.8 - x2*(1-x2*0.005)

            return cost, conc
        end

yuk (generic function with 1 method)
```

Problem 1.4

```
using Plots

# Initialize arrays
conc = zeros(5151)
cost = zeros(5151)

# Initialize index
count = 1

for i = 0:100
        for j = 0:100-i
                conc[count] = yuk(i , j)[2]
                cost[count] = yuk(i, j)[1]
                count = count+1
        end
end

Error: UndefVarError: count not defined

# Plot cost vs. conc showing regulation cutoff
plot(scatter(cost,conc,title = "Cost vs. Concentration per Day", label =
"Treatment Plans"))
hline!([20], width = 3,label = "Regulation")
xlabel!("Cost (Dollars)")
ylabel!("Concentration (kg/day)")
png("Treatments")

# Isolate only combinations that meet regulation
conc_new = []
cost_new =[]
for i = 1:length(conc)
        if conc[i] <= 20
                append!( conc_new, conc[i] )
                append!( cost_new, cost[i] )
        end
end

julia> plot(scatter(cost_new,conc_new,title = "Cost vs. Concentration per
Day", label = "Treatment Plans"))
```

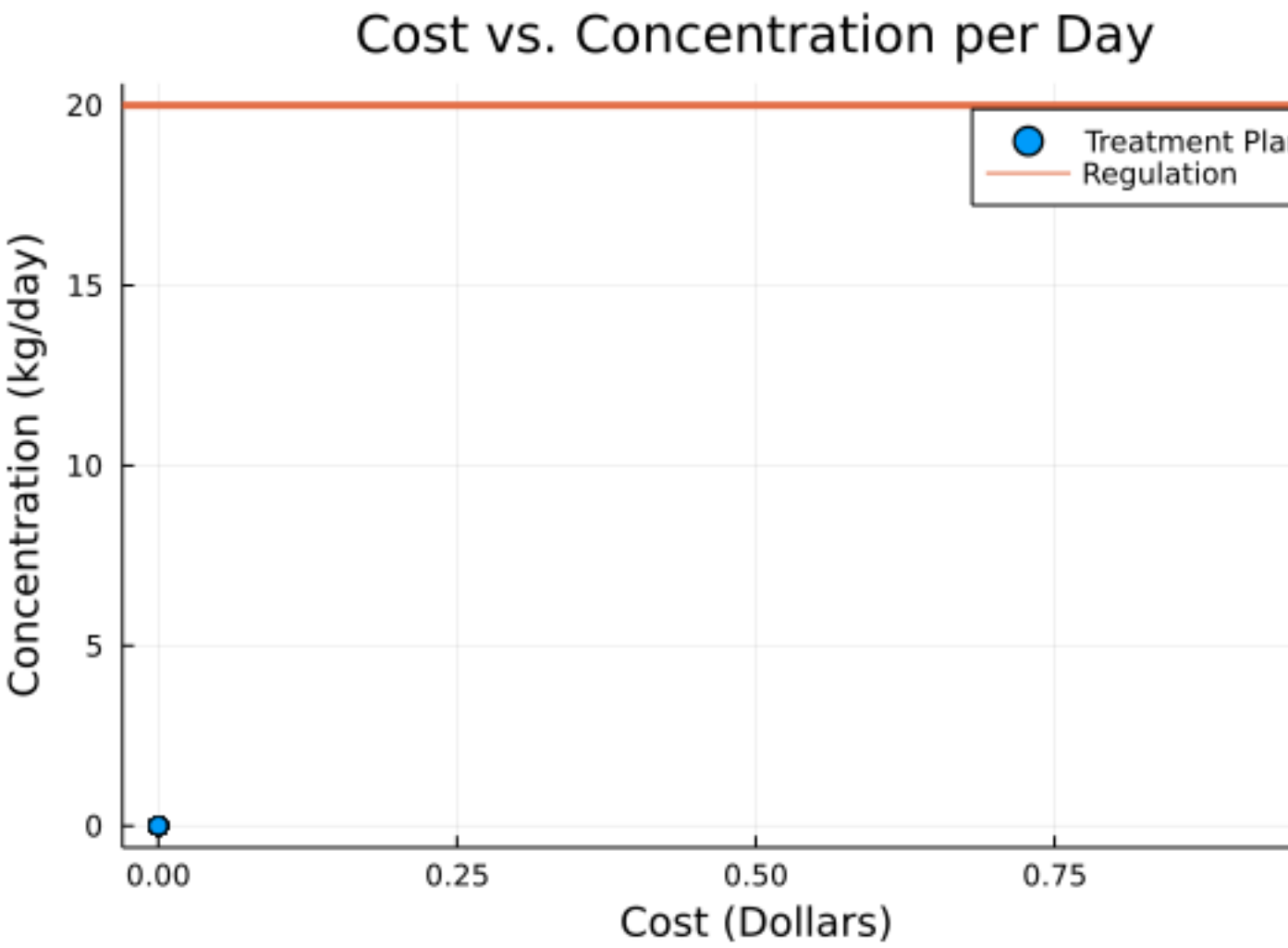
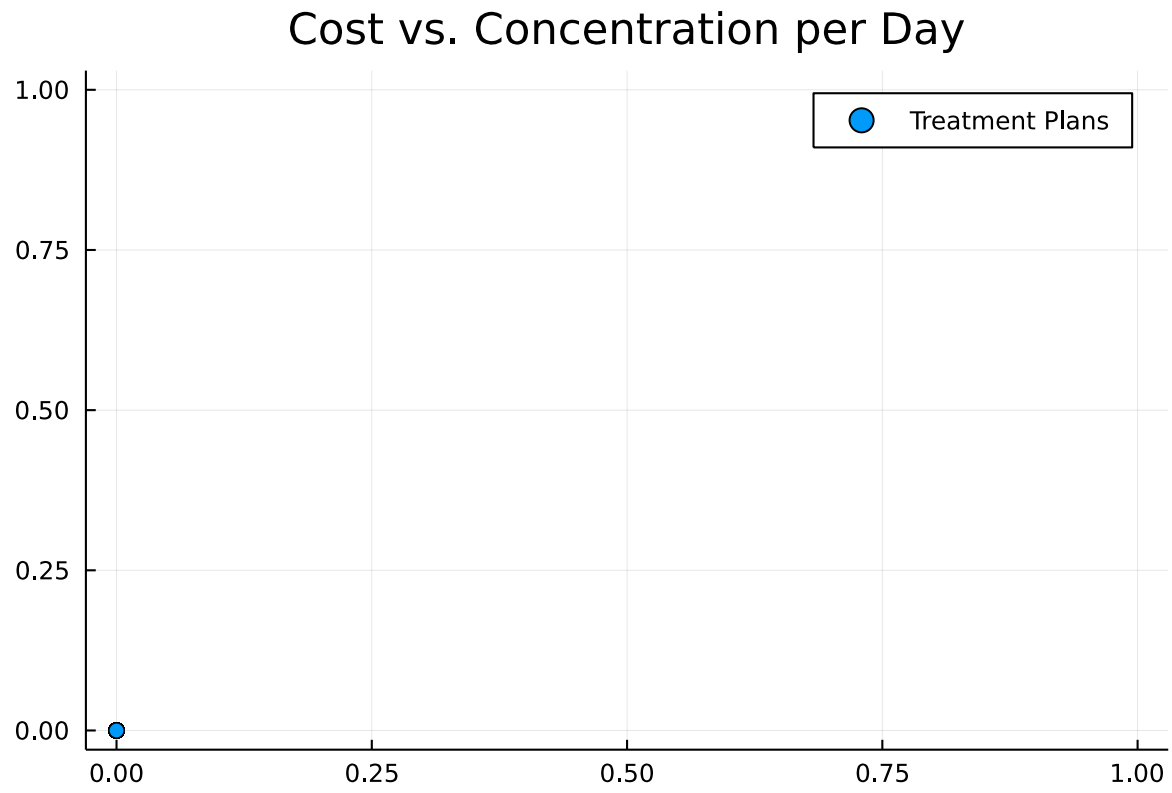
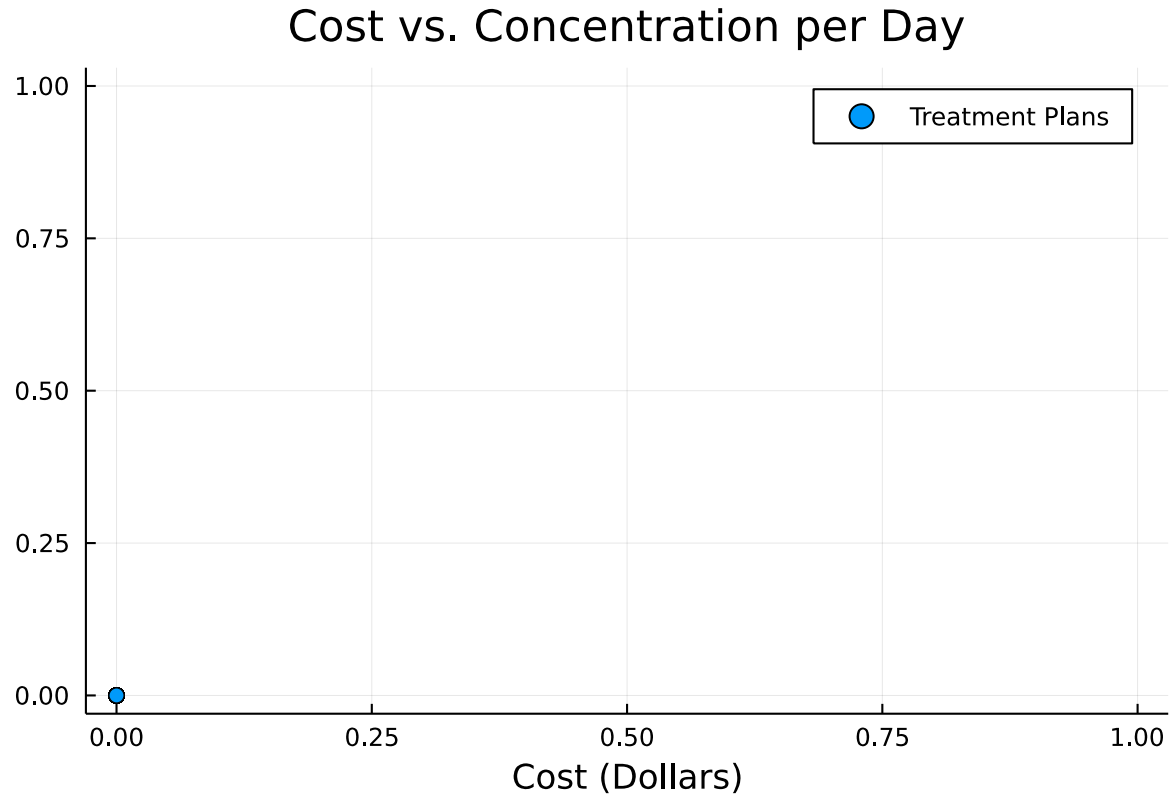


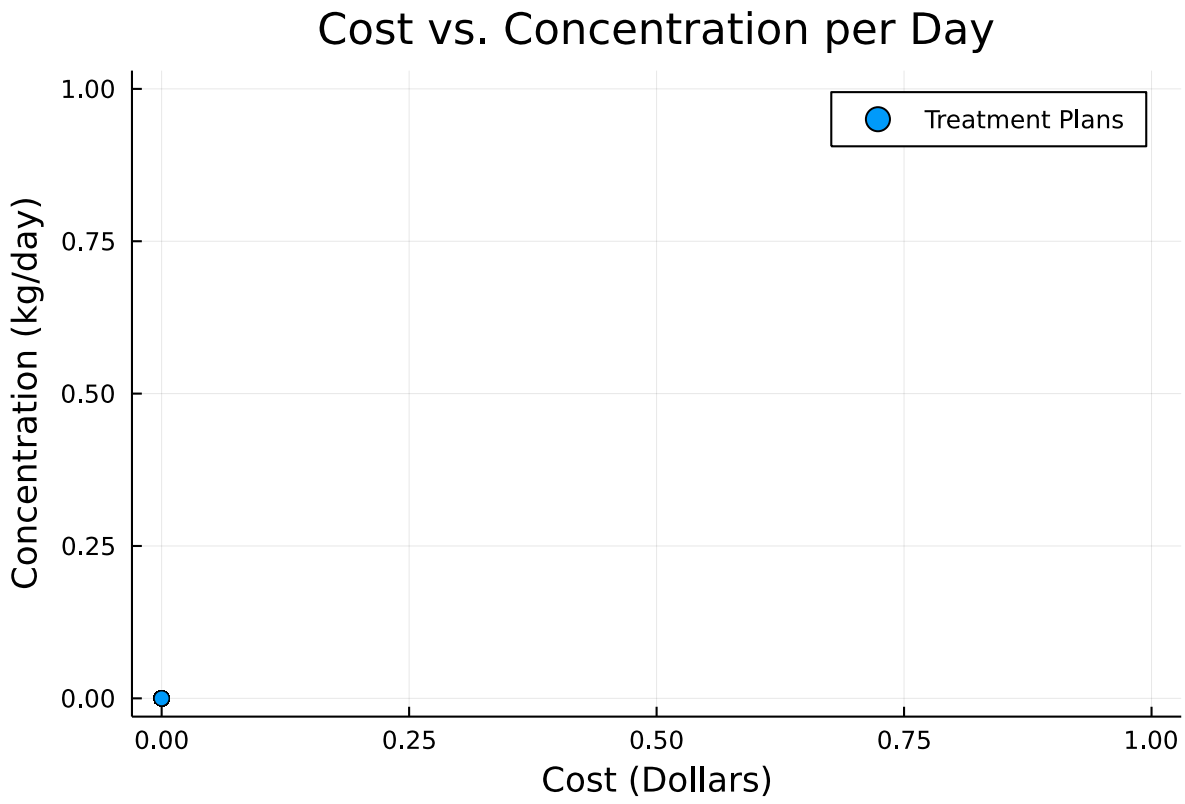
Figure 1: Alternate Text




```
julia> xlabel!("Cost (Dollars)")
```




```
julia> ylabel!("Concentration (kg/day)")
```




```
julia> png("regulation")
```

Problem 1.5

Problem 1.6

Problem 1.7

References

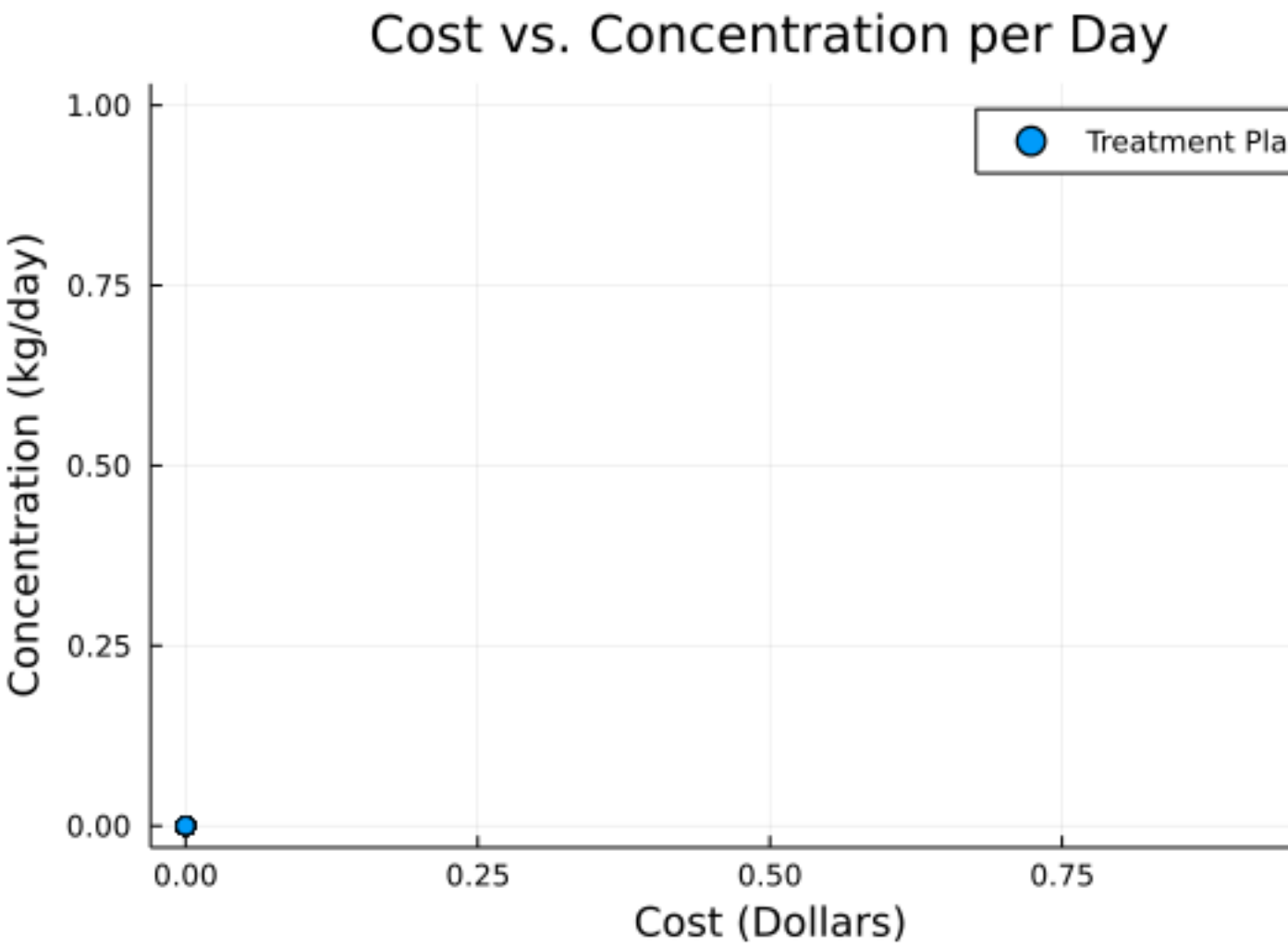


Figure 2: Alternate Text