CS 524 ¶

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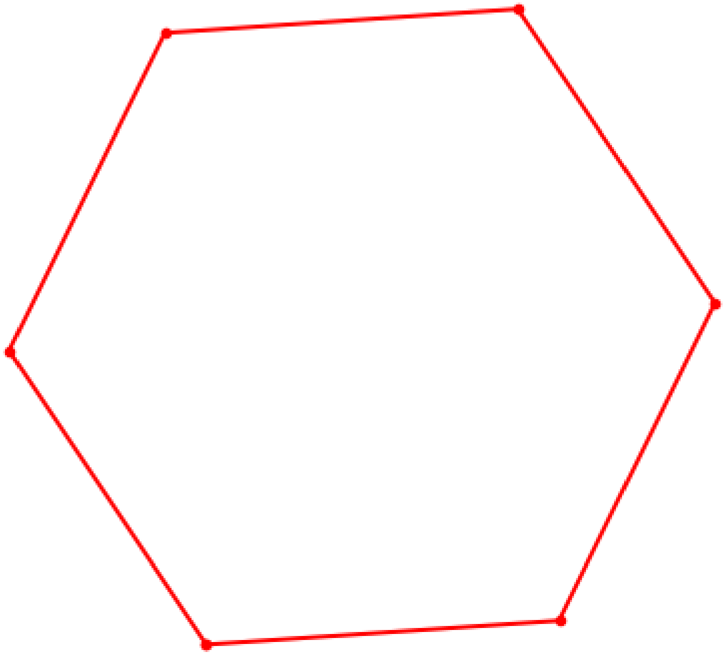
Q1.

In [55]:

```
using JuMP, Ipopt
n = 6
m = Model(solver = IpoptSolver(print_level=0))

@variable(m, x[1:n] )
@variable(m, y[1:n] )

@NLobjective(m, Max, 0.5*sum( x[i]*y[i+1]-y[i]*x[i+1] for i=1:n-1)  +
0.5*(x[n]*y[1]-y[n]*x[1]) )

for i = 1:n
    @constraint(m, x[i]^2 + y[i]^2 <= .5)
end

# add ordering constraint to the vertices
for i = 1:n-1
    @NLconstraint(m, x[i]*y[i+1]-y[i]*x[i+1] >= 0 )
end
@NLconstraint(m, x[n]*y[1]-y[n]*x[1] >= 0 )

srand(0)
setvalue(x,rand(n))
setvalue(y,rand(n))

status = solve(m)
println(status)
println("Optimal area: ", getobjectivevalue(m))
getvalue([x y])

using PyPlot
xopt = getvalue([x; x[1]])
yopt = getvalue([y; y[1]])
figure(figsize=[5,5])
plot( xopt, yopt, "r.-" )
axis("equal");axis("off");
```

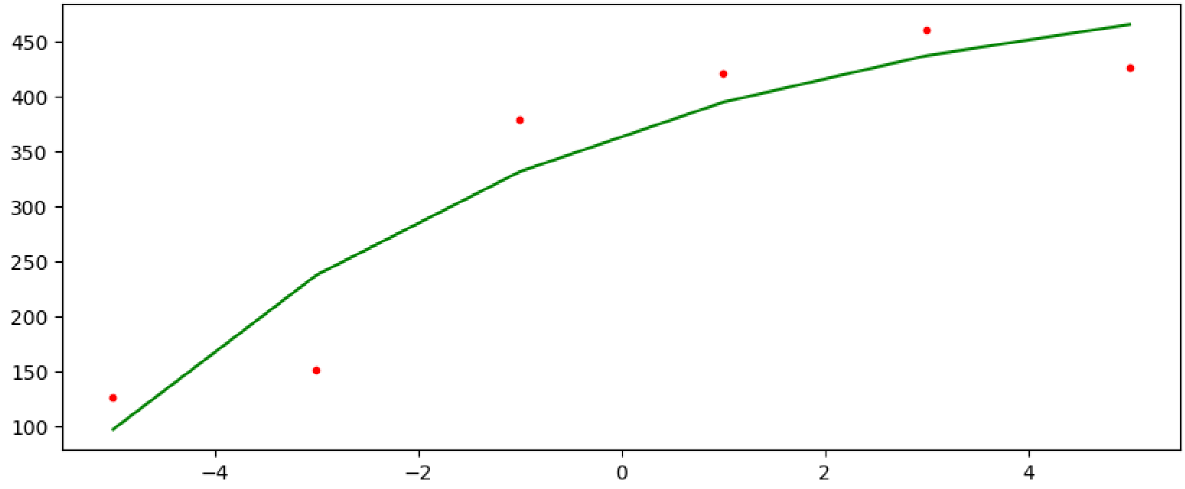


```
Optimal
Optimal area: 1.2990381166219995
```

Q2.

In [80]:

```
using Gurobi, Cbc, Mosek, PyPlot, JuMP, Ipopt

raw = [-5 127
-3 151
-1 379
1 421
3 460
5 426]

x = raw[:,1]
y = raw[:,2]
# println(x)
# println(y)

m = Model(solver = IpoptSolver(print_level=0))
# @variable(m, yopt[1:6])
@variable(m ,k1)
@variable(m ,k2)
@variable(m ,k3)
setvalue(k1, 500)
setvalue(k2, -200)
setvalue(k3, -1)

# for i in 1:6
#     @NLexpression(m, expr[i in 1:6], k1 + k2*exp(k3*x[i]))
# end

@NLobjective(m, Min, sum(((k1 + k2*exp(k3*x[i]))-y[i])^2 for i in 1:6))
solve(m)

println(getvalue(k1))
println(getvalue(k2))
println(getvalue(k3))
k1opt = getvalue(k1)
k2opt = getvalue(k2)
k3opt = getvalue(k3)
using PyPlot
figure(figsize=(10,4))
# xvaluess = linspace(-6,6,)
for i in 1:6
    yvals[i] = k1opt + k2opt*exp(k3opt*x[i])
end
plot(x,yvals,"g-")
plot(x,y,"r.")
```



```
523.3055369939487
-156.94784160483013
-0.1996645707943486
```

```
Out[80]: 1-element Array{PyCall.PyObject,1}:
          PyObject <matplotlib.lines.Line2D object at 0x137a5f910>
```