2.1

$a)$

$M = 1$

$Eout(g) <= Ein(g) + sqrt((1/2N)ln(2M/\delta)$

$(M, N, \delta) = sqrt((1/2N)ln(2M/\delta) <= 0.05$

$sqrt((1/2N)ln(2/0.03) <= 0.05$

$sqrt((1/2N)x4.199) <= 0.05$

$(1/2N)x4.199 <= 0.0025$

$(4.1999/0.005) < N$

$840 <= N$

$b)$

$M = 100$

$Eout(g) <= Ein(g) + sqrt((1/2N)ln(2M/\delta)$

$(M, N, \delta) = sqrt((1/2N)ln(2M/\delta) <= 0.05$

$sqrt((1/2N)ln(200/0.03) <= 0.05$

$sqrt((1/2N)x8.8) <= 0.05$

$(1/2N)x8.8 <= 0.0025$

$(8.8/0.005) < N$

$1760 <= N$

$c)$

$M = 10,000$

$Eout(g) <= Ein(g) + sqrt((1/2N)ln(2M/\delta)$

$(M, N, \delta) = sqrt((1/2N)ln(2M/\delta) <= 0.05$

$sqrt((1/2N)ln(20,000/0.03) <= 0.05$

$sqrt((1/2N)x13.41) <= 0.05$

$(1/2N)x13.41 <= 0.0025$

$(13.41/0.005) <= N$

$2682 <= N$

2.11 (a) $N = 100$

$E_{out}(g) <= Sqrt(E_{in}(g)(8/N)ln((4m_h(2N)/\delta))$

$E_{out}(g) <= Sqrt(E_{in}(g)(8/100)ln((404(200)/.1))$

$E_{out}(g) <= E_{in}(g) + 1.043$

(b) $N = 1000$

$E_{out}(g) <= Sqrt(E_{in}(g)(8/N)ln((4m_h(2N)/\delta))$

$E_{out}(g) <= Sqrt(E_{in}(g)(8/1000)ln((4004(2000)/.1))$

$E_{out}(g) <= E_{in}(g) + 0.356605$

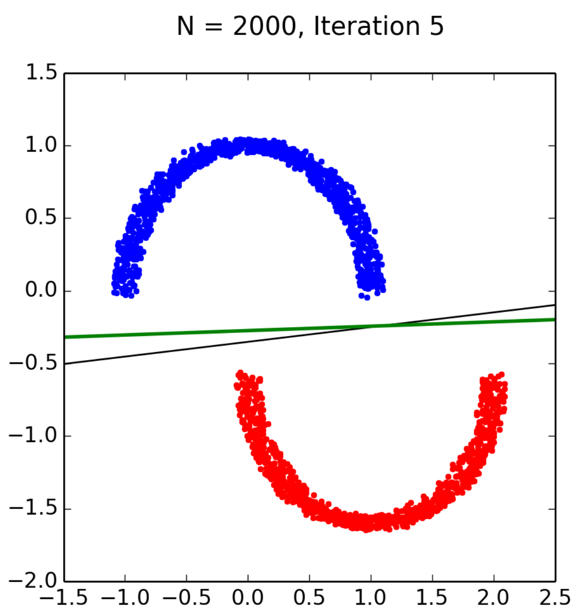
2.12

You would need a sample size of approximately 420,000.

(Updated version on Github)

Problem 3.1

(a) The final hypothesis is [-1, 0.1103083, -3.64935025]



(b) [-0.32275335, 0.09317685, -0.91814928]
Using the perceptron, it is taking a risk that the hypothesis may not be as accurate. However, using the linear regression, you are getting a more static result.