2.1

$a)$

$M = 1$

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

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

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

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

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

$(4.1999/0.005) < N$

$840 <= N$

$b)$

$M = 100$

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

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

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

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

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

$(8.8/0.005) < N$

$1760 <= N$

$c)$

$M = 10,000$

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

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

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

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

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

$(13.41/0.005) < N$

$2682 <= N$