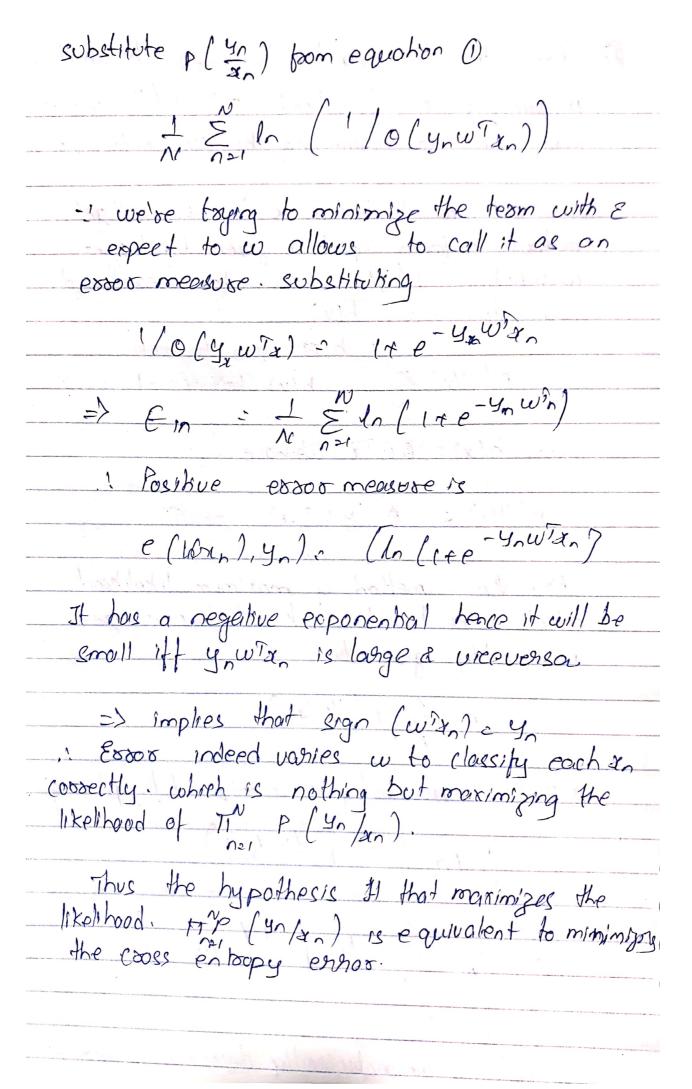
(1) problem 2.1: e(M,N,S) = \(\frac{1}{2N} \ln \frac{2M}{S} \) given S= 0.03 (a) M=1; E = 0.05 E < 1 = lo say of N 7 1/202 ln 2mm N 7, 1 2.10:05)2 (66.666) 200 * 4.199 Fos 07 = 839,941015576/ M=100; E 5 0:05 $N = \frac{1}{2e^2} \ln \frac{2nq}{s} = \frac{1}{2(0.05)^2} \ln \frac{2(100)}{0.005}$ = 200. ln (6,666·6667) = 1760.9750527736/ M= 10000; E 5 0:05 $N = \frac{1}{2c^2} \ln \frac{2M}{c} = \frac{1}{200(0.05)^2} \ln \frac{2(1000)}{0.03}$ = 200 ln (66666666666) = 200x 4. 1074-603569 = 2682,0090899712,

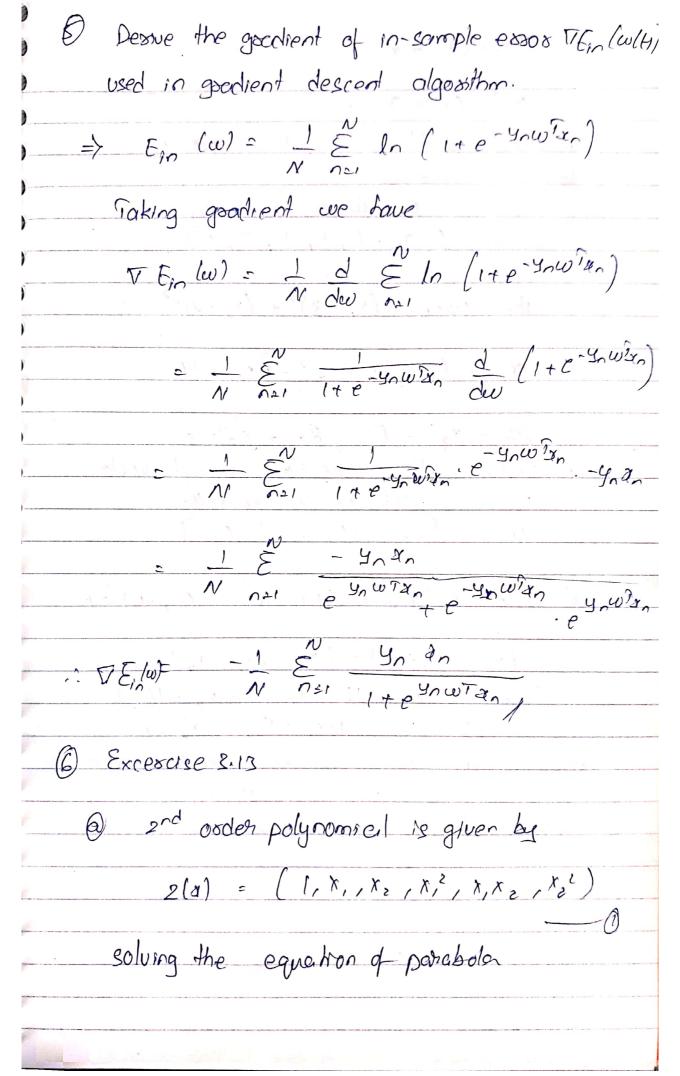
(2) problem 2.3: compute maximum number of dichotomies, my (N) for below and compute duc. For positive pays growth function is equal to N+1

If we enumerate the dichotomies added by negative days would result N-1 (N+1+N-1) " my (N) = 2N largest value of N for which my (N) = 2 m is 2 .: dyc = 2. 1 For positive intervals growth function is equal to Nº12 + N12 +1. After adding new dichotomes generated by negative intervals, we get N-2 and this valid for NYI, similarly if N=1 Since we already generated the two dichotomies with positive intervals alone. i. my (N)=. 2+ 3N-1[ifN > 182ifN=1] we can infer the largest value of N for which $m_{H}(N) = 2^{N}$ is 3 $(m_{H}(L) = 13)$, we have $d_{VC} = 3$ E for growth function of concentric circles, mapping the problem from Rd to Co, + &J. before to that map of defined as

.: Pooblem of concentrale circles in Rd is similar to the problem of positive intervals in R and consequently we can infer that $m_{H}(N) = \frac{N^2}{2} + \frac{N}{2} + 1$ which is independent of d. : Largest value of N for which myeln) = 2N is 2 (my (s) = 7), dve = 2. (3) problem 2.12: we have the following implicit bound for the sample complexity N (with du=100) 6=0:05 and 8=0:05) N / 8 LO (4[EN)10+17 To find N, consider N= 1000 in the R.H.S. N7, 8 10 [4[8.1000] +1] = 2.57251 x10 .. when we try the new value 11 = 2.5787 x 105 in Ritis and iterate the process , rapidly converging to an estimate of N = 4.52957 x 105

Pooue that selecting the hypothesis h that
maximizes the likelihood Time, P(4n/xn) is
equivalent to minimizing the cross entropy error
Sell. The term likelihood is that we will get
output 4 from input & given the larget
drebsbution P(y/x) was indeed captured
by hypotheses hlx)
1 h(x) for y = +1
1 h(x) for y: +1 1 P(y/x) = 1-h(x) for y: -1
using h (x) = 0 w x we have
P(Y/x) = 0 (y w Ta) -0
Now the method of maximum likelihard selecte the hypothesis h which maximizes poobability given by.
The P(yn/xn)
we can equivalently minimize it by placing
$-\frac{1}{N}\left(n\left(\frac{N}{N^{2}}p\left(\frac{4n}{x_{n}}\right)\right)$
$=\frac{1}{N}\sum_{n=1}^{N}\ln\left(\frac{1}{p(y_n(x_n))}\right)$
I (n!) is amonotonically decreasing function





(x,-3)2 + x2 =1 x,2-6x,+9+x2=0 equoting with 1 we have weight wester as below wo, w, w, w, w, w, w= [9,-b,1,1,0,0) 1 The circle (x, -3)2+ (x, -4)2 =1 x, 2-6x, + 9 +x22-8x2+16=1 24 + x2 2 - 6x, - 8x, + x2 =0 equaling with a we have weight vector as wo w, we con up W= [24, -6, -8, 1, 0, 1] (c) The ecllipse 2(2,-3)2 + (x,-4)201 2 [x,2-6x,+9] + [x22-8x2+16] =1 2x12 - 12x 1+18 + x22 - 8x2 + 1601 33 +2x,2 - 12x, -8x, + x2 20 equaling with eq. O we have weight vector as wo w, we we we W: [33, -12, -8 2 0 1]

problem 3.16. g(x)= P[y=+1/x]] Toue classification (+) correct person -1 (intruder) yousay cost (accept) = 0. p (y=+1/a) + (a p(y= -1/x) now g(x) = P[y=+1/x] i for negetive probability. 1-P= 1- 9(x) · · · cost allept - (aglx) cost reject = (> P[y=+1/x] + 0, p[y=-1/2) = (89/x) g(x) for accepting the person is cost (accept) = Cost (sepet) => (a (1-9(x)) = (+9(x)) . : g(x) = ca/cq+(x.; outthoughold will be twice 21: (a/(a+12

@ For Supermarket loss, loss 10.

. 1 K = 110 s 11 makes sense since we

are penalizing mare false reject, when gazak which is very close to refectiong as we want to avoid false rejects.

For CIA (8=1, Ca = 1000

 $1 k = \frac{1000}{1000} = \frac{1000}{1001}$ which is sensible

as we've penalising more for false accept when gla) 71 k which very close to I we are accepting since we want to avoid false accept