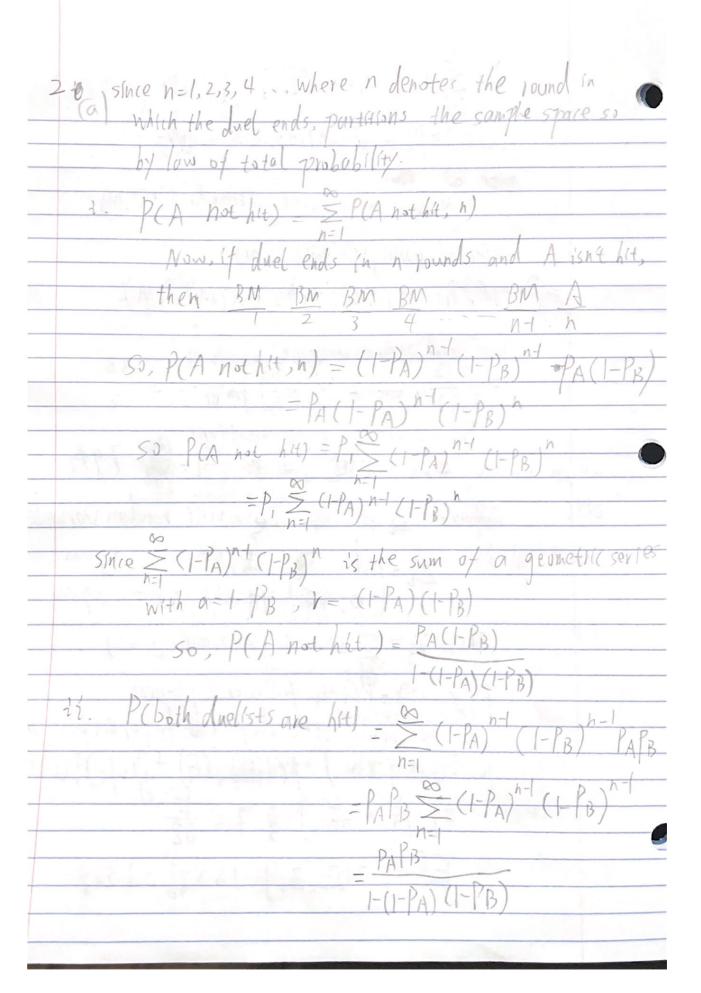
| 1 Linear ale | gebra yefyesher.   |
|--------------|--|
|              | (V/()' - O)' - I/C'  |
| 18           | ecause Q is prehogonal, Q=Q Also, QT(OT)T-QTQ=T (Since Q);   |
|              | (2 0-1 and Q1 over also all and  |
| 41           | over some)   |
| VV           | assume eigen vector is V   |
| W            | eger value is A  |
|              | Then We have $AV = AV$   |
|              | Then $  Av  ^2 =   Av  ^2 =  A ^2   V  ^2$   |
|              | $\frac{1}{1} \frac{1}{1} \frac{1}$ |
|              | 11 Av1 = (Av) (Av) by definition of the length   |
|              |  |
|              | = V'ATAV become A is real  |
|              | = V v because A A = I as A is orthogonal<br>=     V   by definition of the length  |
|              | =  V  by definition of the length  |
| Acres to a   | $  V  ^2 =  \Lambda ^2   V  ^2$  |
|              | Since Vis an elgenvertor, it is non-zero, and hence //v// to   |
|              | (anceling IIVI), we have 1x12=1. Since the length is non-negative, we get  |
|              | 11=  |
| iti.         | Since Q is orthogonal, QQT-I = Q Q by definition   |
|              | Using the fact that olet (AB) = det (A) det (B), we have   |
|              | det (L) = 1= det (QQ') = det (Q) det (Q') = det(Q) det (Q) = Ldet (Q)  |
| 0.10         | Since We have [det(Q)]=/, then det(Q)=±√1=±/   |
|              |  |
| ż۷.          | Cylla Quantograph Teles Market - 200 Market  |
| 0 4          |  |
|              | Show $\ x\  = \ D(x)\ $ . By definition $\ x\  = (x \cdot x)^{\frac{1}{2}}$ and $\ T(x)\  = (T(x) \cdot T(x))$ . Since Q is orthogonal, we know that $x \cdot x = D(x) \cdot Q(x)$ , so the results show that Q defines a length preserving transformation   |
|              | (Ince ) 4. NY House We know that X. X = TO(X). Q(X), So the results  |
|              | Street 13 defines a length presenting transformation   |
|              | Show that I williams   |

| (b) | Assume we have a egenvalues [x, x, x, de value) that we sponding eigenvectors +                         |
|-----|---|
|     | = = [X = [X = [X = X = X = X = X = X = X  |
|     | Since $Ax = Ax$ , we have $AW - WS = A - W \ge W$<br>Since $  x   _2^2 =   then W^T - W   A = W \ge W$  |
|     | Since A's SVD decomposition is $A = UDV' - UI = V'$ Thus, $A - VD'U' - VI = VI$                         |
|     | Then ATA = VDTUTUDV   |
|     | Thus A's right singular vector V is ATA's eigenvector.  |
|     | and ATA's eigenvalue is the square of the singular value  |
|     | Same: AAT-UDV VDTUT = UDDTUT = US UT Thus, A's left singular vector is the W built by AAT's eigenvocast |
|     | and AAT's eigenvalue is the guare of the singular value   |

| (-)    |  |
|--------|--|
| (C) 1. | False. At most n distinct eigenvalues  |
| 1      | tales It Vi and V2 dre eigenvectors of A corresponding to  |
|        | False If Vi and V2 dre eigenvectors of A corresponding to !!   |
|        | Contributed to be an elementer of the arthur to  |
|        | In fact unless VI and Vz are scalar multiples of each other (eV= 1/2).   |
|        | V, + V2 Will not satisfy the eigenvector equation Av = AV for any single eigenvalue  |
| /      | The state of the s |
| ill    | Correct  |
|        | Correct  |
| V.     | Corret   |



Shots in 3 possible ways: OA hit DBhit

Then, by law of total probability

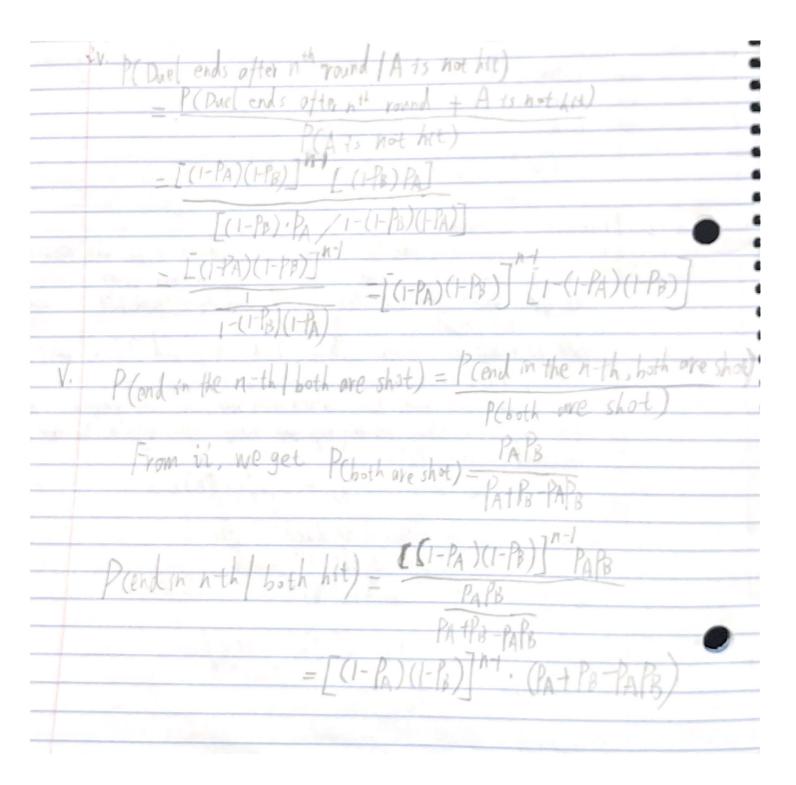
P(duel ends after nth round)

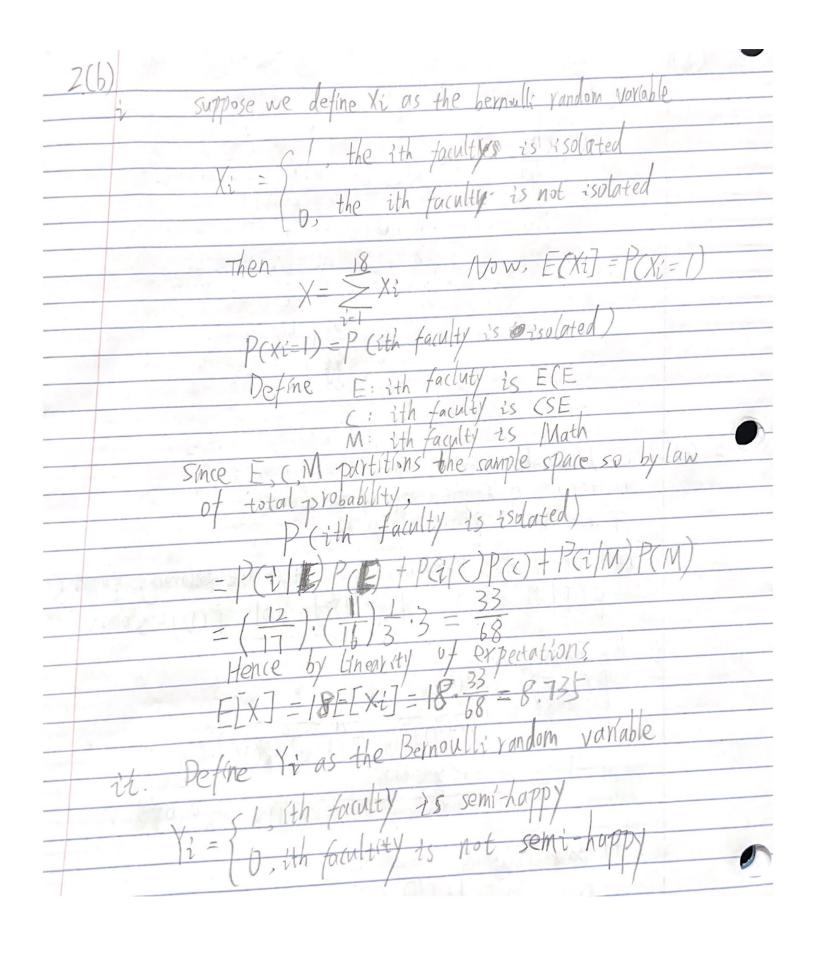
-(1-PA) n-1 (1-PB) n-1 (1-PA) PB + (1-PA) N-1 (1-PB) PA (1-PB)

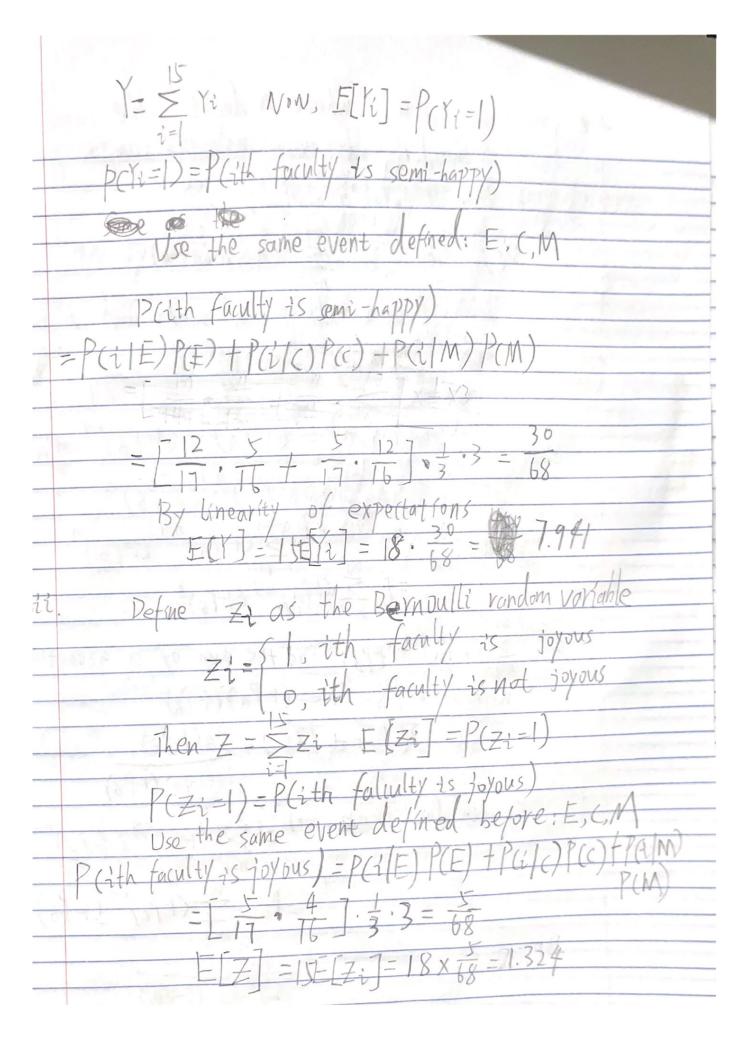
+(1-PA) n-1 (1-PB) n-1 (1-PB) n-1

-(1-PA) (1-PB) [1-PA] PA PB

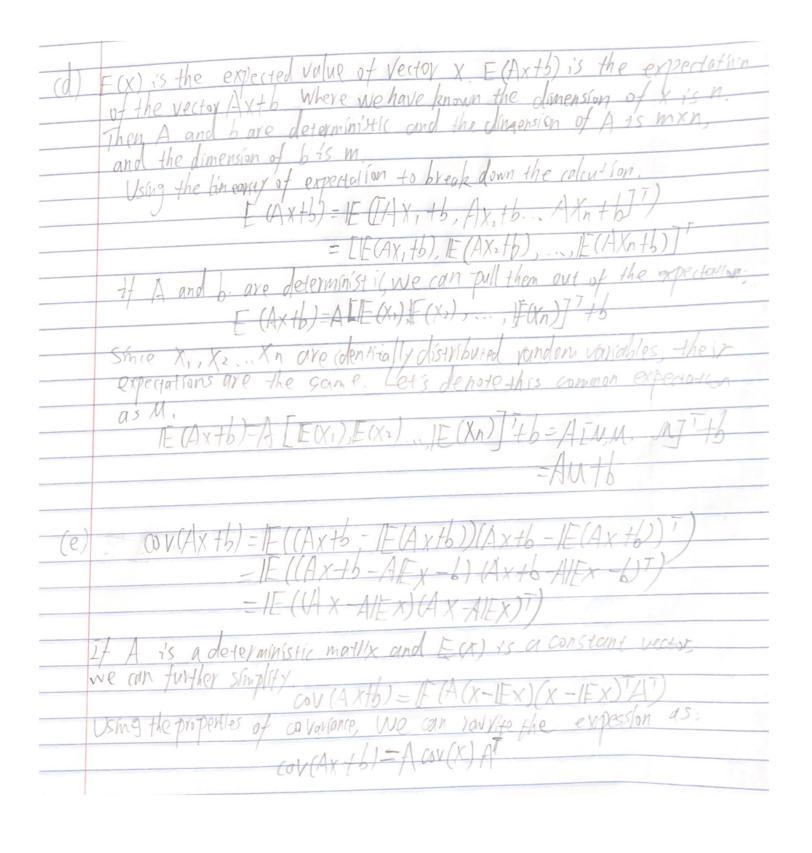
-[(1-PA)(1-PB)] [1-(1-PA)(1-PB)]

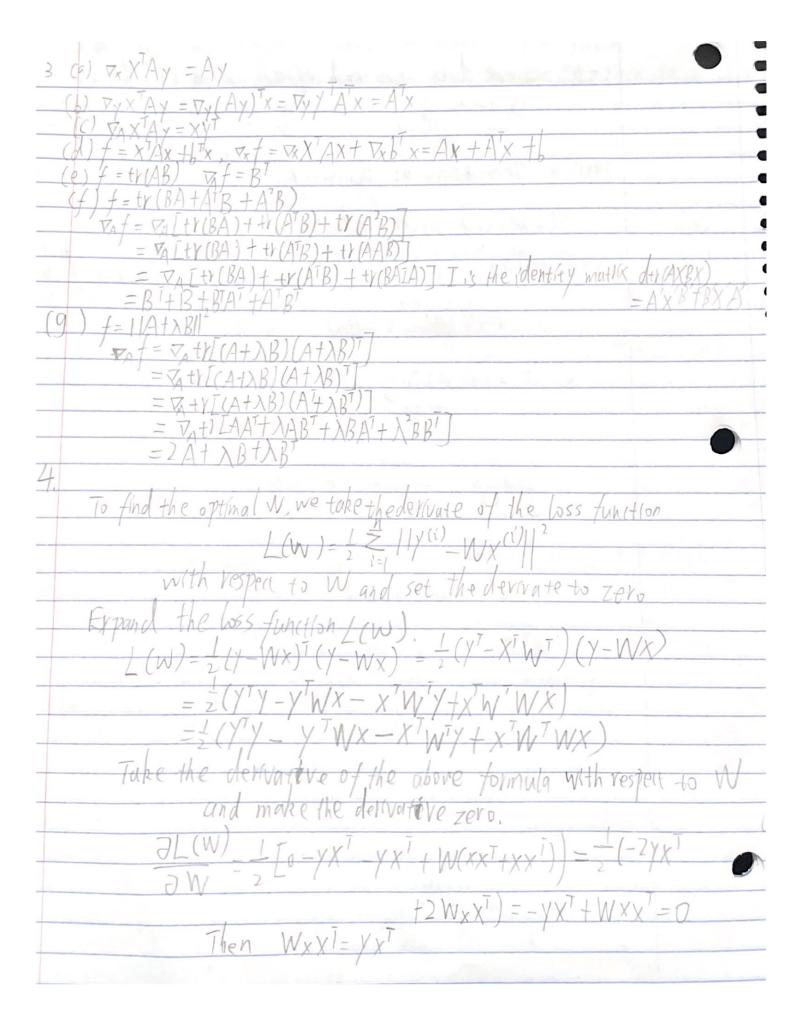






| 2. (c) Let's define the following events:                                 |                          |
|---|--------------------------|
| D; mon has a dangerous type of the disease  T man has a positive LSA test | 12.47 CHE 17             |
| From the problem statement, we are given                                  | the following quantities |
| $P(T D) = 0.9 P(T D^{c}) = 0.01$  | P(D)=0.0005              |
| i. By Bayes law, P(TID) P(D)  |                          |
| P(TID)P(D)+P(TID)P(I)   | *                        |
| 0.9 x 0.0005<br>= 0.9 x 0.0005 + 0.01 x 0.9995                            | = 0.043                  |
| 12. By Bayes law, Charles   |                          |
| D(NIT') = P(T D)P(D)  | - 0.   X 0 v30]          |
| P(T(D)ROHP(TYD)P(D)   | = 0.000050528            |
|   | - 0.0000 ) 0> 23         |





Now we can find the optimal payameter W by solving the above equation

A common method for solving equations is to use Normal Equation:

W = /xT (xxT)

