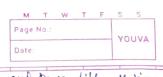
2281053-2281205-2281025 34 63 him X is random Variable With mean 11, and variance o2. a) we first prove that for c>0, P(X-M > ?) < 62 Let Y is random variable given by Y= X-11 then by E(Y)= E(X-M)= E(X)-E(M)= E(X)-M= H-M=0  $Var(y) = E(y - E(y))^2 = E(y)^2 = E((x - u)^2) = Var(x) = E^2$ Let b>0, be arbitary positive real number. let Z be rondom variable given by,  $Z = (y+b)^2$ then,  $E(z) = E((y+b)^2) = E(y^2 + 2yb + b^2)$ = E(y2)+ E(2Yb)+E(b2) = E(y2) + E(b2) + 2bE(y) = 52+62+0=62+62 now we prove that \* Y> ? > Z> (8+6)2 Proof: him # (y-2) > 0 now Z-(2+b)2= (y+b)-(2+b)2  $= \frac{(\gamma - 2)(\gamma + 21b)}{0} > 0$   $\Rightarrow Z > (2+b)^{2}$ .. P(Y>°) ≤ P(Z>(°+b)2) using Markov's inequality, (a) Z is non-negative)  $P(y \ge r) \le P(Z \ge (r+b)^2) \le \frac{E(Z)}{(r+b)^2} = \frac{6^2+b^2}{(r+b)^2}$ p(y>€) ≤ €2+b2 (€+b)2 : b is arbitiony positive real number. we can minimize  $\frac{6^2+b^2}{(2+b)^2}$  let  $l = \frac{6^2+b^2}{(2+b)^2}$ One way is not to see I as further of bo and we differentiation



But, we minimize it use using the town inequality

 $\int = 6^2 + b^2$   $(2+b)^2$ 

put d= @+b , (note: 620 => x>@)

 $\chi(x) = \int_{-\infty}^{\infty} \frac{1}{(x^2)^2} = \frac{1}{(x^2)$ 

now as x> ? .. l'as differential wirt x.

 $\frac{1(x) = -2(6^{2} + 2e^{2}) + 2e}{\alpha^{3}} = \frac{2(ex - (e^{2} + e^{2}))}{\alpha^{3}}$ 

e ((d)=0 => d= 62+72

co for x > 6, 45, 1, (x) > 0

we put  $x = \frac{e^2 + e^2}{e}$  is point of minime we put  $x = \frac{e^2 + e^2}{e}$  in x = e + b

=> b= 6<sup>2</sup>

Now we put  $b = C^2$  in  $1 = C^2 + b^2$  ( $(c+b)^2$ )

 $\frac{(6+65)^{5}}{(6+65)^{5}} = \frac{65}{(6+65)^{5}}$ 

(> 62 = 62 (1+62) (2+62

. b(1>6) = €5 (or p>0 con outrinad)

=> P(X-4>2) 4 52 2+62 (b) Now we prove for ELO, we have, P(x-u>e) > 1- 62

> we first oberse that X-438 => 11-X <- ? now - 2 >0

i from  $E(\mu - \chi) = E(\mu) - E(\chi) = \mu - E(\chi)$   $V_{0, \gamma} \left(\mu - \chi\right) = E\left[\left(\mu - \chi\right)^{2}\right]$ = E[(x-x1)2]=62

i Var (u-v)= 2 and - 2 >0 in from previous argument, applying on u-x, 

> now P(u-x >- 2) = P(x-u = 2) now : {x x ?

now :: SN/N-4= 23 cm SN/N-4> 2}

are mutually exclusive and extraution sets.

P(x-42)+P(x-428)=)

1- p(x-4>e) == p(x-45e)

from (1) and (2)

1-p(x-4>8)=p(x-468) 4 52

=> P(x-4>8) > 1- 62

Now if we X to be continous in neighbourhood of x=4+2 then P(x=4+2)=0

=> P(x-4>2)/1-62