HW ASTR513 Nee1

 Γ $\chi_1 \dots \chi_n \longrightarrow N(M, \sigma^2)$

a) $U_1 = (x_1 + x_2 + \dots + x_n)$

 $= N(a, b^2)$

a = 1 nu

 $6^2 = \frac{50^2}{5^2} = \frac{50^2}{5^2}$

 $N(u, \sigma^2/n)$

 $\frac{b|_{U_2} = 2(1 + x_2 + \cdots + x_n)}{= N(a, b^2)}$

a= Zu = nu

b2 = no2

 $N(nu, n\sigma^2)$

c)
$$U_3 = x_1 - x_2$$

 $\sim N(a, b^2)$

$$a = 1.(u) - 1(u) = 0$$

$$b^{2} = 1\frac{3}{2} + (-1)^{2}\sigma^{2}$$

$$= 2\sigma^{2}$$

$$N(0, 20^2)$$

d)
$$V_4 = \frac{\chi_1}{\sigma_2} - \frac{\chi_2}{\sigma_2}$$

$$\sim N(a, b^2)$$

$$0 = 1 u - 1 u = 0$$

$$0 = 0$$

$$6^2 = \frac{1}{20^2} + \frac{1}{20^2} = 1$$

e)
$$U_5 = x_1 + x_2 + x_3 - 3x_4$$

$$0 = 1(u) + 1(u) + 1(u) - 3(u)$$

= 0

$$b^{2} = 1(\sigma^{2}) + 1(\sigma^{2}) + 1(\sigma^{2}) + 9(\sigma^{2})$$

$$= (2\sigma^{2})$$

$$= N(0, 12\sigma^{2})$$

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$$= N(0, 120^2)$$

$$\times$$
 ~ Gramma($v/2,2$)

$$(n-1)5^2 \sim 7(n-1)$$

$$\frac{2(2(1-x)^2 \times 2^n)^2}{\sigma^2}$$

HW3 ASTR513 New $4, 42, 43 \sim N(0, 1)$ U= € 0+0+0 = 0 02=30020)4 N(Mu, 0,2) = N(0,02/3) $2. U_2 = 4_1^2 + 4_2^2 + 4_3^2$ $= \chi_3^2 \qquad (con 60 derived)$ Using mgf) Chisquare 3 dof

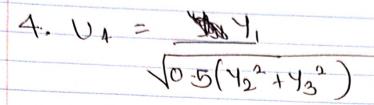
$$3 - U_3 = \frac{(y_1 + y_2)}{\sqrt{2}}$$

If ZNN(0,1) Wr Xv2 & Z, W indep

 $\frac{y_1 + y_2}{\sqrt{2}} \sim N(0,1)$

·. U3 = T, S / 1 2 et 1

students t with 1 dop



Y, ~ N(0,1)

 $42^{2}+43^{2} \wedge X_{2}^{2} \rightarrow \text{Chisquare 2dop}$

: U4 = T2 students T with 2 dof

 $5. V_5 = \frac{24_1^2}{4_2^2 + 4_3^2}$

 $F = w_1/v_1 \qquad w_1, w_2 \text{ indep } \chi^2 \text{ RV}$ $w_2/v_2 \qquad \text{with } v_1, v_2 \text{ elof}$

F distribution ~ FV1, V2

with $v_1 Q v_2 dq$ $v_5 = \frac{4^2/1}{(4^2+4^2)/2}$ $\frac{(4^2+4^2)/2}{(4^2+4^2)/2}$

 $\frac{1}{2} \frac{1}{2} \frac{1}$