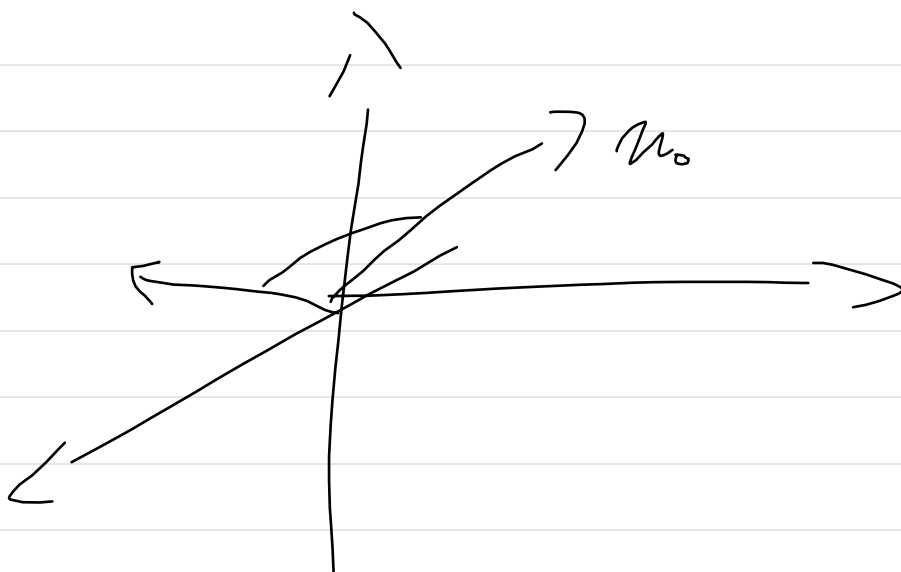


17A-Q3-7

$$\mathbb{E} \left[\underbrace{\langle w_0, u \rangle^2}_{\substack{\text{unit length vector}}} \right] = \frac{1}{p}$$



$$\mathbb{E} \left[\underbrace{\langle w_0, u \rangle^2}_{\text{unit-length vector}} \right] = \mathbb{E} \left[\|w_0\|_2 \times |1| \cos^2 \theta \right]$$

$$= \mathbb{E} [\|w_0\|^2] \times \mathbb{E} [\cos^2 \theta]$$

$$= 1 \times \mathbb{E} [\cos^2 \theta]$$

w_0 and u
is random
so assume $\cos^2 \theta \sim \chi(2)$

$$\mathbb{E}[\cos^2 \theta]$$

where

$$\cos^2 \theta \sim U(0, 1)$$

$p_1, \dots, p_n$ are probabilities

each $\sum_i p_i = 1$

$$\mathbb{E}[\cos^2 \theta] = \frac{1}{p}$$

12.1.1.1...

