Practice Assessment 7

(1)

||P it is measured in the same direction

(2) λ range $-\pi \leq \lambda \leq \pi$

$$f(\hat{n}, \lambda) = \begin{cases} +1, & \lambda \geq 0, \\ -1, & \lambda < 0, \end{cases}$$

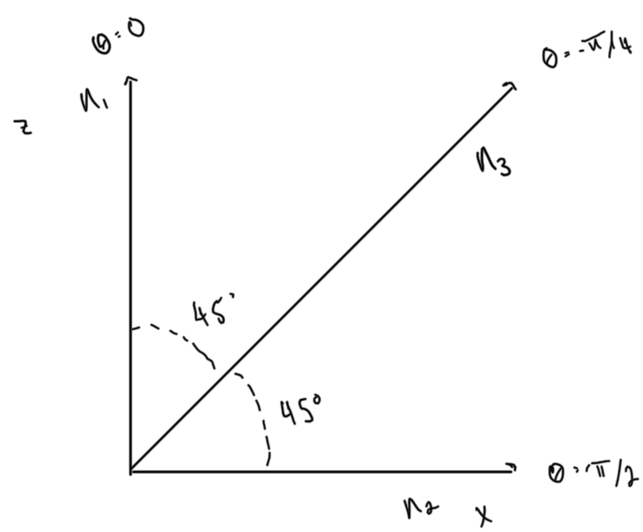
Probability density

$$\rho(\lambda) \geq 0, \quad \text{and} \quad \int \rho(\lambda)\, d\lambda = 1$$

$$\rho(\lambda) = 1 = A \int_{-\pi}^{\pi} \lambda^2\, d\lambda \Rightarrow 1 = A\left[\frac{2\pi^3}{3}\right]$$

$$A = 3/2\pi^3 \rightarrow 0.48 = A \qquad \boxed{\rho(\lambda) = 0.48\lambda^2}$$

(3)



$$E(\hat{n}_1, \hat{n}_2) = \int \rho(\lambda) f_1(\hat{n}_1, \lambda) f_2(\hat{n}_2, \lambda)\, d\lambda$$

[illegible]

$$F_1(\hat{n}_1,\lambda)=1 \qquad f_2(\hat{n}_2,\lambda)=-1$$

$$E(\hat{n}_1,\hat{n}_2) = -\int_{-\pi}^{\pi} 0.48\lambda^2 (1)(1)\,d\lambda = -9.92$$

$$E(\hat{n}_1,\hat{n}_3) = -\int_{-\pi}^{\pi} 0.48\lambda^2 f_1(\hat{n}_1,\lambda)\, f_2(\hat{n}_3,\lambda)\,d\lambda$$

$$f_1(\hat{n}_1,\lambda)=1 \qquad f_2(\hat{n}_3,\lambda)=-1$$

$$E(\hat{n}_1,\hat{n}_2) = -\int_{-\pi}^{\pi} 0.48\lambda^2 (1)(1)\,d\lambda = -9.92$$

$$E(\hat{n}_2,\hat{n}_3) = -\int_{-\pi}^{\pi} 0.48\lambda^2 (-1)(1)\,d\lambda = 9.92$$

(c) Show $|E(\hat{n}_1,\hat{n}_2) - E(\hat{n}_1,\hat{n}_3)| \le 1 + E(\hat{n}_2,\hat{n}_3)$

$$|-9.92 - (-9.92)| \le 1 + 9.92$$

$$\boxed{\rightarrow 0 \le 10.92}$$