

3.31 Determine the distance between the following pairs of points:

(a) $P_1 = (1, 1, 2)$ and $P_2 = (0, 2, 3)$,

(b) $P_3 = (2, \pi/3, 1)$ and $P_4 = (4, \pi/2, 3)$,

(c) $P_5 = (3, \pi, \pi/2)$ and $P_6 = (4, \pi/2, \pi)$.

Solution:

(a) From Eq. (3.66),

$$d = \sqrt{(0-1)^2 + (2-1)^2 + (3-2)^2} = \sqrt{3}.$$

(b) From Eq. (3.67),

$$d = \sqrt{2^2 + 4^2 - 2(2)(4) \cos\left(\frac{\pi}{2} - \frac{\pi}{3}\right) + (3-1)^2} = \sqrt{24 - 8\sqrt{3}} \approx 3.18.$$

(c) From Eq. (3.68),

$$d = \sqrt{3^2 + 4^2 - 2(3)(4) \left(\cos \frac{\pi}{2} \cos \pi + \sin \pi \sin \frac{\pi}{2} \cos \left(\pi - \frac{\pi}{2} \right) \right)} = 5.$$
