

Sample Questions 1: Points in Space

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1. Find the distance between the points $(1, -2, 3)$ and $(-2, 3, 3)$.

Solution: Recall that the distance between two points (x_1, y_1, z_1) and (x_2, y_2, z_2) is

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

Hence, in our case,

$$D = \sqrt{(-2 - 1)^2 + (3 - (-2))^2 + (3 - 3)^2} = \sqrt{(-3)^2 + (5)^2 + 0^2} = \sqrt{9 + 25 + 0} = \sqrt{34}$$

2. Convert the point $(r, \theta, z) = (3, \pi/6, 5)$ into rectangular coordinates.

Solution: We have seen in class that $x = r \cos \theta$ and $y = r \sin \theta$. Therefore, the rectangular coordinates of the point in question is

$$(x, y, z) = (r \cos \theta, r \sin \theta, z) = \left(3 \cos \frac{\pi}{6}, 3 \sin \frac{\pi}{6}, 5\right) = \left(3 \cdot \frac{\sqrt{3}}{2}, 3 \cdot \frac{1}{2}, 5\right) = \left(\frac{3\sqrt{3}}{2}, \frac{3}{2}, 5\right)$$