Topic: Distance between polar points

Question: Calculate the distance between the polar coordinate points.

$$(1,\pi)$$

$$\left(1,\frac{\pi}{3}\right)$$

Answer choices:

A $\sqrt{5}$

B $\sqrt{3}$

C 2

D 1

Solution: B

To find the distance between two polar coordinates, we'll use the formula

$$D = \sqrt{r_1^2 + r_2^2 - 2r_1 r_2 \cos\left(\theta_1 - \theta_2\right)}$$

where $\left(r_1, \theta_1\right)$ and $\left(r_2, \theta_2\right)$ are the given polar points. It doesn't matter which point we use for $\left(r_1, \theta_1\right)$ and $\left(r_2, \theta_2\right)$, but it's easier to make θ_1 the larger of the two θ values, since we subtract θ_2 from θ_1.

We'll set

$$\left(r_1, \theta_1\right) = (1, \pi)$$

$$\left(r_2, \theta_2\right) = \left(1, \frac{\pi}{3}\right)$$

Plugging these points into the distance formula, we get

$$D = \sqrt{(1)^2 + (1)^2 - 2(1)(1)\cos\left(\pi - \frac{\pi}{3}\right)}$$

$$D = \sqrt{2 - 2\cos\left(\frac{2\pi}{3}\right)}$$

$$D = \sqrt{2 - 2\left(-\frac{1}{2}\right)}$$

$$D = \sqrt{2 + 1}$$

$$D = \sqrt{3}$$

Topic: Distance between polar points

Question: Calculate the distance between the polar coordinate points.

$$\left(3, \frac{4\pi}{3}\right)$$

$$\left(2, \frac{\pi}{2}\right)$$

Answer choices:

A $\sqrt{13 + 6\sqrt{3}}$

B $\sqrt{13 - 6\sqrt{3}}$

C 1

D $\sqrt{19}$

Solution: A

To find the distance between two polar coordinates, we'll use the formula

$$D = \sqrt{r_1^2 + r_2^2 - 2r_1 r_2 \cos\left(\theta_1 - \theta_2\right)}$$

where $\left(r_1, \theta_1\right)$ and $\left(r_2, \theta_2\right)$ are the given polar points. It doesn't matter which point we use for $\left(r_1, \theta_1\right)$ and $\left(r_2, \theta_2\right)$, but it's easier to make θ_1 the larger of the two θ values, since we subtract θ_2 from θ_1.

We'll set

$$\left(r_1, \theta_1\right) = \left(3, \frac{4\pi}{3}\right)$$

$$\left(r_2, \theta_2\right) = \left(2, \frac{\pi}{2}\right)$$

Plugging these points into the distance formula, we get

$$D = \sqrt{(3)^2 + (2)^2 - 2(3)(2)\cos\left(\frac{4\pi}{3} - \frac{\pi}{2}\right)}$$

$$D = \sqrt{9 + 4 - 12\cos\left(\frac{8\pi}{6} - \frac{3\pi}{6}\right)}$$

$$D = \sqrt{13 - 12\cos\left(\frac{5\pi}{6}\right)}$$

$$D = \sqrt{13 - 12\left(-\frac{\sqrt{3}}{2}\right)}$$

$$D = \sqrt{13 + 6\sqrt{3}}$$

Topic: Distance between polar points

Question: Calculate the distance between the polar coordinate points.

$$\left(5, \frac{\pi}{4}\right)$$

$$\left(3, \frac{3\pi}{2}\right)$$

Answer choices:

A $\sqrt{34 - 15\sqrt{2}}$

B $\sqrt{23\sqrt{2}}$

C $\sqrt{11\sqrt{2}}$

D $\sqrt{34 + 15\sqrt{2}}$

Solution: D

To find the distance between two polar coordinates, we'll use the formula

$$D = \sqrt{r_1^2 + r_2^2 - 2r_1 r_2 \cos\left(\theta_1 - \theta_2\right)}$$

where $\left(r_1, \theta_1\right)$ and $\left(r_2, \theta_2\right)$ are the given polar points. It doesn't matter which point we use for $\left(r_1, \theta_1\right)$ and $\left(r_2, \theta_2\right)$, but it's easier to make θ_1 the larger of the two θ values, since we subtract θ_2 from θ_1.

We'll set

$$\left(r_1, \theta_1\right) = \left(3, \frac{3\pi}{2}\right)$$

$$\left(r_2, \theta_2\right) = \left(5, \frac{\pi}{4}\right)$$

Plugging these points into the distance formula, we get

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

$$D = \sqrt{9 + 25 - 30\cos\left(\frac{6\pi}{4} - \frac{\pi}{4}\right)}$$

$$D = \sqrt{34 - 30\cos\left(\frac{5\pi}{4}\right)}$$

$$D = \sqrt{34 - 30\left(-\frac{\sqrt{2}}{2}\right)}$$

$$D = \sqrt{34 + 15\sqrt{2}}$$