

§10.3 | # 7 | Convert polar point $(5, \pi)$ into Cartesian coords;

Soln: Using formulas $(r, \theta) = (5, \pi)$ and

$$\begin{cases} x = r \cos(\theta) \\ y = r \sin(\theta) \end{cases}$$

We observe that

$$\begin{cases} x = 5 \cos(\pi) = -5 \\ y = 5 \sin(\pi) = 0 \end{cases}$$

Hence the Cartesian coords are

$$(x, y) = (-5, 0).$$

11 | Convert Cartesian point $(4, 2)$ into polar coords.

Soln: Using formulas $(x, y) = (4, 2)$ and

$$\begin{cases} r = \sqrt{x^2 + y^2} \\ \theta = \begin{cases} \arctan(y/x) & \sim \text{when } (x, y) \text{ in QI or QIV} \\ \arctan(y/x) + \pi & \sim \text{when } (x, y) \text{ in QII or QIII} \end{cases} \end{cases}$$

We see

$$\begin{cases} r = \sqrt{4^2 + 2^2} = \sqrt{20} \\ \theta = \tan^{-1}\left(\frac{2}{4}\right) \approx 0.463 \text{ rad} \end{cases} \Rightarrow (r, \theta) = (\sqrt{20}, 0.463)$$

12 | Convert Cartesian point $(-4, 6)$ into polar coords.

Soln: Here $(x, y) = (-4, 6)$, so

$$\begin{cases} r = \sqrt{(-4)^2 + 6^2} = \sqrt{52} \\ \theta = \tan^{-1}\left(\frac{6}{-4}\right) + \pi \approx 2.158 \text{ rad} \end{cases}$$

$$\Rightarrow (r, \theta) = (\sqrt{52}, 2.158)$$

§10.8

2

#9 $\vec{P_1P_2} = \vec{P_2} - \vec{P_1} = \langle 3, -2 \rangle - \langle 5, 1 \rangle = \langle 3-5, -2-1 \rangle$
 $= \langle -2, -3 \rangle$

$\vec{P_3P_4} = \vec{P_4} - \vec{P_3} = \langle 9, -4 \rangle - \langle -1, 3 \rangle = \langle 9-(-1), -4-3 \rangle$
 $= \langle 10, -7 \rangle$

No — $\vec{P_1P_2}$ is not equal to $\vec{P_3P_4}$.

#11 ~~$\vec{P_1P_2} = \langle 3, -2 \rangle$~~

$\vec{P_1P_2} = \langle -4, 5 \rangle - \langle -1, -1 \rangle = \langle -3, 6 \rangle$

$\vec{P_3P_4} = \langle -13, 12 \rangle - \langle -10, 6 \rangle = \langle -3, 6 \rangle$

Yes — $\vec{P_1P_2}$ is equal to $\vec{P_3P_4}$

#17 $4\vec{v} + 2\vec{u} = 4\langle -2, -3 \rangle + 2\langle 1, 5 \rangle$
 $= \langle -8, -12 \rangle + \langle 2, 10 \rangle$
 $= \langle -6, -2 \rangle$

#18 $\vec{u} + \vec{v} = \langle 2, -3 \rangle + \langle 1, 5 \rangle = \langle 3, 2 \rangle$
 $\vec{u} - \vec{v} = \langle 2, -3 \rangle - \langle 1, 5 \rangle = \langle 1, -8 \rangle$
 $2\vec{u} - 3\vec{v} = 2\langle 2, -3 \rangle - 3\langle 1, 5 \rangle = \langle 4, -6 \rangle + \langle -3, -15 \rangle$
 $= \langle 1, -21 \rangle$

$$\#29 \quad \text{mag}(\langle 6, 5 \rangle) = \sqrt{6^2 + 5^2} = \sqrt{36 + 25} = \sqrt{61}$$

$$\text{dir}(\langle 6, 5 \rangle) = \tan^{-1}\left(\frac{5}{6}\right) = 0.694 \text{ rad}$$

$$\#31 \quad \text{mag}(\langle -4, -6 \rangle) = \sqrt{(-4)^2 + (-6)^2} = \sqrt{16 + 36} = \sqrt{52}$$

$$\text{dir}(\langle -4, -6 \rangle) = \tan^{-1}\left(\frac{-6}{-4}\right) + \pi = 4.124 \text{ rad}$$

$$\#33 \quad \vec{u} \cdot \vec{v} = \langle -1, -1 \rangle \cdot \langle 1, 5 \rangle = (-1)(1) + (-1)(5) = -1 - 5 = -6$$

$$\#34 \quad \vec{u} \cdot \vec{v} = \langle -2, 4 \rangle \cdot \langle -3, 1 \rangle = (-2)(-3) + 4(1) = 6 + 4 = 10$$