§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 points $(4,2)$ 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

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

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

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

#11 $\cancel{\overrightarrow{P_1P_2} = \langle 3,-2\rangle}$

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

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

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

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