HW-4  Name ________________________________ Section _____

1. Fill in the blanks for $r$ and $\theta$ and the components of $\vec{v}$:

\[ \langle 5, 12 \rangle = \langle \text{__} \cos \text{__}, \text{__} \sin \text{__} \rangle \quad \langle -3, 4 \rangle = \langle \text{__} \cos \text{__}, \text{__} \sin \text{__} \rangle \]
\[ \langle 7, -7 \rangle = \langle \text{__} \cos \text{__}, \text{__} \sin \text{__} \rangle \quad \langle -15, 0 \rangle = \langle \text{__} \cos \text{__}, \text{__} \sin \text{__} \rangle \]
\[ \langle -16, -7 \rangle = \langle \text{__} \cos \text{__}, \text{__} \sin \text{__} \rangle \quad \langle 0, -10 \rangle = \langle \text{__} \cos \text{__}, \text{__} \sin \text{__} \rangle \]

$||\vec{v}|| = 15$ and direction $\vec{v} = 135^\circ$  \hspace{1cm} $\vec{v} = \langle \text{__} , \text{__} \rangle$

$||\vec{v}|| = 40$ and direction $\vec{v} = 60^\circ$  \hspace{1cm} $\vec{v} = \langle \text{__} , \text{__} \rangle$

$||\vec{v}|| = 20$ and direction $\vec{v} = 110^\circ$  \hspace{1cm} $\vec{v} = \langle \text{__} , \text{__} \rangle$

2. $\vec{v} = \langle 2, -7 \rangle$, $\vec{w} = \langle 4, 12 \rangle$, $\vec{a} = 3\vec{i} + 12\vec{j}$ and $\vec{b} = 14\vec{i} - 9\vec{j}$

\[ ||\vec{w}|| = \text{__________} \quad ||\vec{a}|| = \text{__________} \]

\[ \vec{v} + \vec{w} = \text{__________} \quad 3\vec{v} - 4\vec{w} = \text{__________} \]
\[ -2\vec{a} + 6\vec{b} = \text{__________} \quad 0.5\vec{v} - 0.4\vec{a} = \text{__________} \]

\[ ||\vec{v} + \vec{w}|| = \text{__________} \quad ||\vec{v}|| + ||\vec{w}|| = \text{__________} \]
\[ ||\vec{v}|| \cdot ||\vec{w}|| = \text{__________} \quad ||\vec{a}|| \cdot ||\vec{b}|| = \text{__________} \]

3. A red ball moves at a constant rate along a straight line and in one second passes from point $P(2, 3)$ to point $Q(5, 7)$ measured in feet.

(a) Give a parametric representation of the path of the ball according to $t$ in seconds.

(b) A blue ball rolls the same path but does it in 3 seconds. Give a parametric representation of the path of this ball according to $t$ in seconds.
(c) Determine the velocity and speed of both the red and blue balls.

4. (a) A purple ball rolls the path of a circle with radius \( r = 4 \) which fixed about a point considered \((0,0)\) every \(2\pi\) seconds. Give a parametric representation of the path of the ball according to time \(t\) in seconds.

(b) A yellow ball rolls the same path but does it every \(18\) seconds. Give a parametric representation of the path of the ball according to \(t\) in seconds.

(c) A green ball rolls the same path but does it every \(\pi\) seconds and its circle of radius \(r = 4\) is centered at a point considered \((3, -5)\). Give a parametric representation of the path of the ball according to \(t\) in seconds.

5. Determine \(\frac{dy}{dt}, \frac{dx}{dt}, \frac{dy}{dx}\) for part (4c) at the given times.

\[
\begin{align*}
\text{at } t = \frac{\pi}{3} & : & \frac{dy}{dt} = & \frac{dx}{dt} = & \frac{dy}{dx} = \\
\text{at } t = \frac{5\pi}{6} & : & \frac{dy}{dt} = & \frac{dx}{dt} = & \frac{dy}{dx} = \\
\text{at } t = \frac{3\pi}{2} & : & \frac{dy}{dt} = & \frac{dx}{dt} = & \frac{dy}{dx} = \\
\end{align*}
\]

6. Determine \(\frac{dy}{dt}, \frac{dx}{dt}, \frac{dy}{dx}\) for part (4b) at the given times.

\[
\begin{align*}
\text{at } t = 1.5 & : & \frac{dy}{dt} = & \frac{dx}{dt} = & \frac{dy}{dx} = \\
\text{at } t = 15.75 & : & \frac{dy}{dt} = & \frac{dx}{dt} = & \frac{dy}{dx} = \\
\end{align*}
\]