

4. [14 points]

a. [4 points]

- i) The point P lies on a circle of radius three and it corresponds to the angle 140° . Find the coordinates of the point P . Round your answers to the nearest 0.001.

$$P = \underline{\hspace{10em}}.$$

- ii) Find angles $0^\circ < \alpha, \beta < 360^\circ$, but not equal to 140° , such that

$$\sin \alpha = \sin 140^\circ \quad \alpha = \underline{\hspace{10em}}.$$

$$\cos \beta = \cos 140^\circ \quad \beta = \underline{\hspace{10em}}.$$

- b. [5 points] Let $0^\circ < \theta < 45^\circ$. For each blank space below, determine whether the number on the left is greater than, less than, or equal to the number on the right, and fill in the blank with the symbol $>$, $<$, or $=$ respectively. If there is not enough information to decide, write None in the blank space.

$$\sin \theta \underline{\hspace{2em}} \sin(180^\circ + \theta) \qquad \sin \theta \underline{\hspace{2em}} \sin(180^\circ - \theta).$$

$$\sin \theta \underline{\hspace{2em}} \sin(720^\circ + \theta) \qquad \cos \theta \underline{\hspace{2em}} \sin \theta.$$

$$\cos(-\theta) \underline{\hspace{2em}} \cos \theta.$$

- c. [5 points] A beetle starts at the point $A = (0, 4)$ on a circle with radius of 4 inches centered at the origin. The beetle walks ten seconds at a constant speed of 0.5 inches per second around the circle in the *clockwise* direction. Find the **exact** coordinates of the final location of the beetle on the circle. Show all your work.

