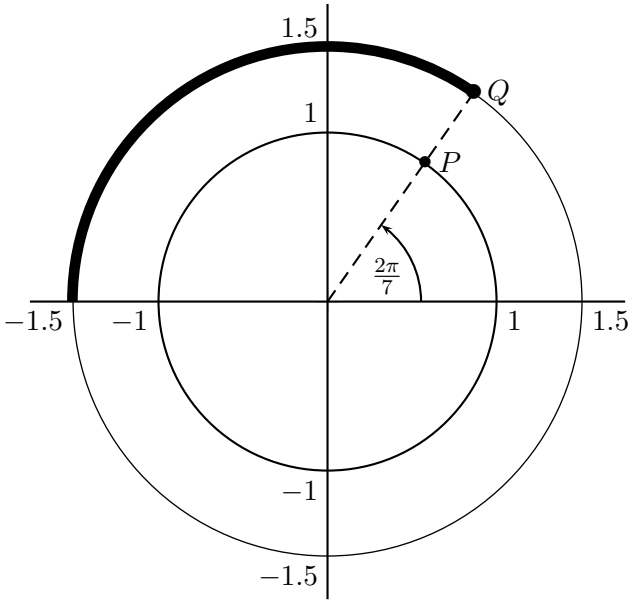
9. [9 points] Consider the points P and Q determined by the angle $\dfrac{2\pi}{7}$ as shown in the diagram below.



You don't have to show work, but any work you do show may be considered for partial credit. **Give all answers in *exact form*.**

a. [2 points] Find the coordinates of the point P.

Answer: The coordinates of P are ($\cos(2\pi/7)$, $\sin(2\pi/7)$).

b. [2 points] Find the coordinates of the point Q.

Answer: The coordinates of Q are ($1.5\cos(2\pi/7)$, $1.5\sin(2\pi/7)$).

c. [2 points] Find the length of the counterclockwise path from the point Q to the point $(-1.5, 0)$. (This path is shown in **bold** in the diagram above.)

Solution: The angle spanned by the path is $\pi - \dfrac{2\pi}{7} = \dfrac{5\pi}{7}$ radians. Hence the arclength is $1.5\left(\dfrac{5\pi}{7}\right) = \dfrac{7.5\pi}{7}$ units.

Answer: $\dfrac{7.5\pi}{7}$ **units**

d. [3 points] An ant begins at the point P, walks *clockwise* along the unit circle for 3 units and then stops. What are the coordinates of the point at which the ant stops?

Solution: Walking along the *unit* circle for 3 units corresponds to walking along an arc spanned by an angle measuring 3 radians. Since the ant walks *clockwise*, the final coordinates of the ant are thus the coordinates of the point on the unit circle determined by the angle $\frac{2\pi}{7} - 3$.

Answer: The coordinates of this point are ($\cos\left(\dfrac{2\pi}{7} - 3\right)$, $\sin\left(\dfrac{2\pi}{7} - 3\right)$).