6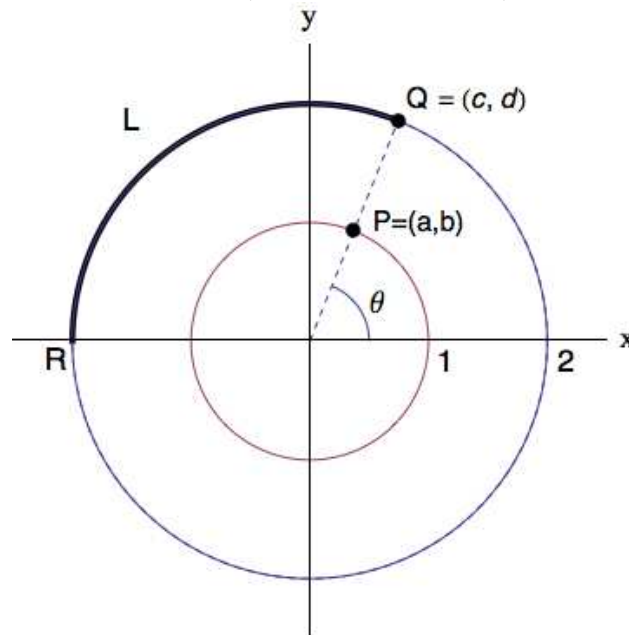. [6 points] The points $P = (a, b)$ and $Q = (c, d)$ lie on the unit circle and the circle of radius 2, respectively, centered at the origin. The point P lies in the line segment between the origin and the point Q. The angle θ (measured in radians), is formed by the positive x-axis and the line between the origin and the point Q (see the figure below).

a. [2 points] Find an expression in terms of θ that computes the length L of the arc between the points Q and $R = (-2, 0)$ (see the the arc in bold in the figure above).

$$L = \underline{\hspace{5cm}}.$$

> *Solution:* $L = 2(\pi - \theta)$.

b. [4 points] Find a formula for each of the quantities below **only** in terms of the constants **a** and/or **b**.

$\cos\theta = \underline{\hspace{3cm}}$ $\tan\theta = \underline{\hspace{3cm}}$

$c = \underline{\hspace{3cm}}$ $\sin(\theta + \pi) = \underline{\hspace{3cm}}$

> *Solution:* $\cos\theta = a$ $\tan\theta = \dfrac{b}{a}$ $c = 2a$ $\sin(\theta + \phi) = -b.$