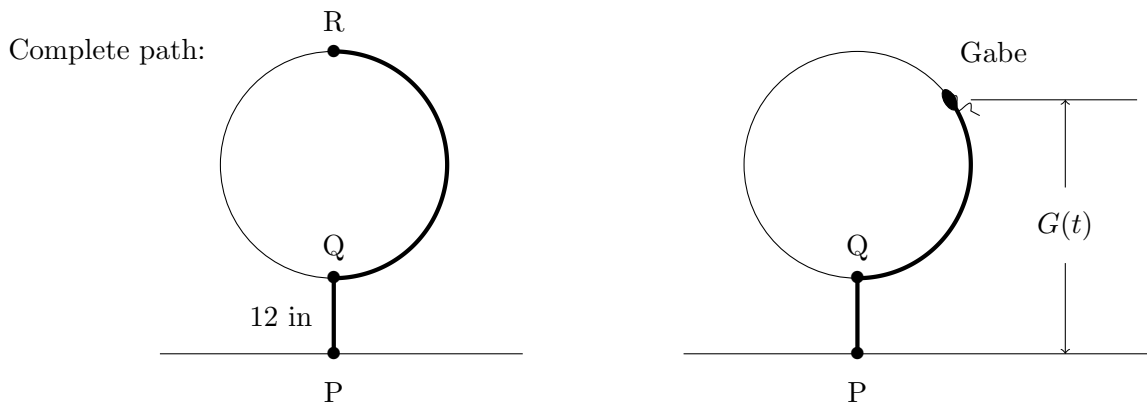


2. [13 points] After Blizzard left Arizona, Gabe the mouse found a large globe (a sphere) to climb. The globe has a diameter of 40 inches and it is attached to a 12-inch-long pole. Gabe starts at the base of the pole at point P . He climbs up to the bottom of the globe at point Q . He then climbs the globe along a semicircle until he stops at the top of the globe at point R (see the diagram below). Note that the diagram is not drawn to scale.



- a. [8 points] Assume that Gabe walks through the path at a velocity of 3 inches per second. Let $G(t)$ be Gabe's height above the ground (in inches) t seconds after he started his climb at point P . Find a piecewise-defined formula for $G(t)$. Be sure to include the domain for each piece.

$$G(t) = \begin{cases} \text{_____} & \text{for } \text{_____} \\ \text{_____} & \text{for } \text{_____} \end{cases}$$

- b. [5 points] After climbing the globe, Gabe jumps onto a small ferris wheel. Let $H(t)$ be his height, in inches, above the ground t seconds after Gabe jumped, where

$$H(t) = 12 + 9 \cos\left(\frac{\pi}{75}(t - 120)\right).$$

Find the the *smallest* positive value of t at which Gabe's height above the ground is 10.5 inches. Clearly show each step of your algebraic work. Give your answer in *exact* form.

Answer: $t =$ _____

3. [5 points] Let

$$B(k) = e^{-4k^2} \tan(k + 3).$$

Use the limit definition of the derivative to write an explicit expression for $B'(5)$. *Your answer should not involve the letter B. Do not attempt to evaluate or simplify the limit.* Please write your final answer in the answer box provided below.

Answer: $B'(5) =$