3. [4 points] An insect population in a certain large park varies sinusoidally from a low of 10 million on January 1st to a high of 70 million on July 1st. Let $P(t)$ be the population in the park of this insect, in millions, t months after January 1st. Find a formula for $P(t)$.

Answer: $P(t) =$ _____

4. [5 points] Let

$$g(x) = \begin{cases} \dfrac{\arctan x}{x} & x \neq 0, \\ 1 & x = 0. \end{cases}$$

You are given that $g'(0)$ exists. Use the limit definition of the derivative to write an explicit expression for $g'(0)$. *Your answer should not involve the letter g. Do not attempt to evaluate or simplify the limit.* Write your final answer in the answer box provided below.

Answer: $g'(0) =$