An ant with mass $m$ is standing peacefully on top of a horizontal, stretched rope. The rope has mass per unit length $\mu$ and is under tension $T$. You then start a sinusoidal transverse wave of wavelength $\lambda$ propagating along the rope, where the motion of the rope is in a vertical plane. What minimum wave amplitude will make the ant become momentarily weightless? Assume that $m$ is so small that the presence of the ant has no effect on the propagation of the wave.

Assume the acceleration due to gravity is $g$ (where $g$ is a positive number).

Express your answer in terms of $\mu$, $m$, $g$, $\lambda$, $T$ and numerical constants.

Answer: ________________________________