

# The Theoretical Minimum

## Quantum Mechanics - Solutions

L10E01

Last version: [tales.mbivert.com/on-the-theoretical-minimum-solutions/](https://tales.mbivert.com/on-the-theoretical-minimum-solutions/) or [github.com/mbivert/ttm](https://github.com/mbivert/ttm)

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**Exercise 1.** *Find the second time derivative of  $x$  in Eq. 10.9, and thereby show that it solves Eq. 10.8.*

Eq. 10.9 and 10.8 respectively are:

$$x(t) = A \cos(\omega t) + B \sin(\omega t); \quad -\omega^2 x(t) = \ddot{x}(t)$$

Where I've systematically made the time-dependence explicit by replacing  $x$  with  $x(t)$ . This is an elementary differentiation exercise that I think has already been performed in the previous volume on classical mechanics. Nevertheless:

$$\begin{aligned} \dot{x}(t) &= -A\omega \sin(\omega t) + B\omega \cos(\omega t) \\ \ddot{x}(t) &= -A\omega^2 \cos(\omega t) - B\omega^2 \sin(\omega t) \\ &= -\omega^2 \underbrace{(A \cos(\omega t) + B \sin(\omega t))}_{=:x(t)} \\ &= -\omega^2 x(t) \quad \square \end{aligned}$$