

(1) Solve the simple harmonic oscillator equation of motion  $\ddot{x} + \omega_0^2 x = 0$  using the ansatz  $x(t) = ae^{i\omega t}$  by first solving for the value(s) of  $\omega$ , and then applying the initial conditions  $x(0) = x_0$  and  $\dot{x}(0) = v_0$ . Show that the result is a purely real number and in fact agrees with our original solution in terms of sine and cosine functions.

(2) A child sits on the end of a flexible diving board, which vibrates vertically with frequency  $f = \omega/2\pi$ . Find an expression for the amplitude  $A$  of the vertical oscillations so that the child loses contact with the board. Calculate this displacement when  $f = 5$  Hz.