1. A spring/mass oscillator obeys

$$m\ddot{x} = F$$

where
$$F = -sx.$$

It has mass $\mathbf{m} = 0.01$ kg and a spring constant $\mathbf{s} = 16$ N/m. Calculate the frequency in Hz, the angular frequency in radians, and the period T of the oscillations.

2. Suppose that $\psi(t)$ describes the behavior of an oscillator that obeys

$$\ddot{\psi} + \omega_0^2 \psi = 0$$

a) $\omega_0 = 1 \text{ s}^{-1}$. The oscillator is started from $\psi = 0$ with an initial velocity $\psi = 0.2$ m/s. What are the amplitude and phase for the solution?

b) $\omega_0 = 0.3 \text{ s}^{-1}$. The oscillator is started from rest with an initial position $\psi = -1.2 \text{ m}$. What are the amplitude and phase for the solution?

3. For the oscillator of problem 1,

$$x(t) = A\sin(\omega t + \delta).$$

It is set into oscillation with amplitude $\mathbf{A} = 0.01$ m and a phase constant $\boldsymbol{\delta} = 0.367$. Find the total energy **E**. If $\boldsymbol{\delta}$ is changed to 1.263, what is the final energy?

4. A bit harder than it looks! Problem 1.5 in Pain, Chapter 1

5. How would you write the following in the form x + iy?

a) 1/i
b) exp(iπ)
c) exp(iπ/2)

d) i^1

6. What are the solutions of $z^2 + 2z + 2 = 0$?