18.03 Differential Equations: Week 5

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Progress Update

Over the past week we have covered:

1. Sinusoidal functions
2. Constant coefficient linear ODEs

Sinusoidal Functions

All of this discussion of fairly trivial functions will be justified in the next unit; we define a sinusoidal function as one in the form of

$$f(x) = A\cos(\omega t - \phi) \tag{1}$$

where we defined A as amplitude, ω as angular frequency, ϕ as phase lag, and other derivative variable defined in voice.

Example Problem

Consider the following example problem:

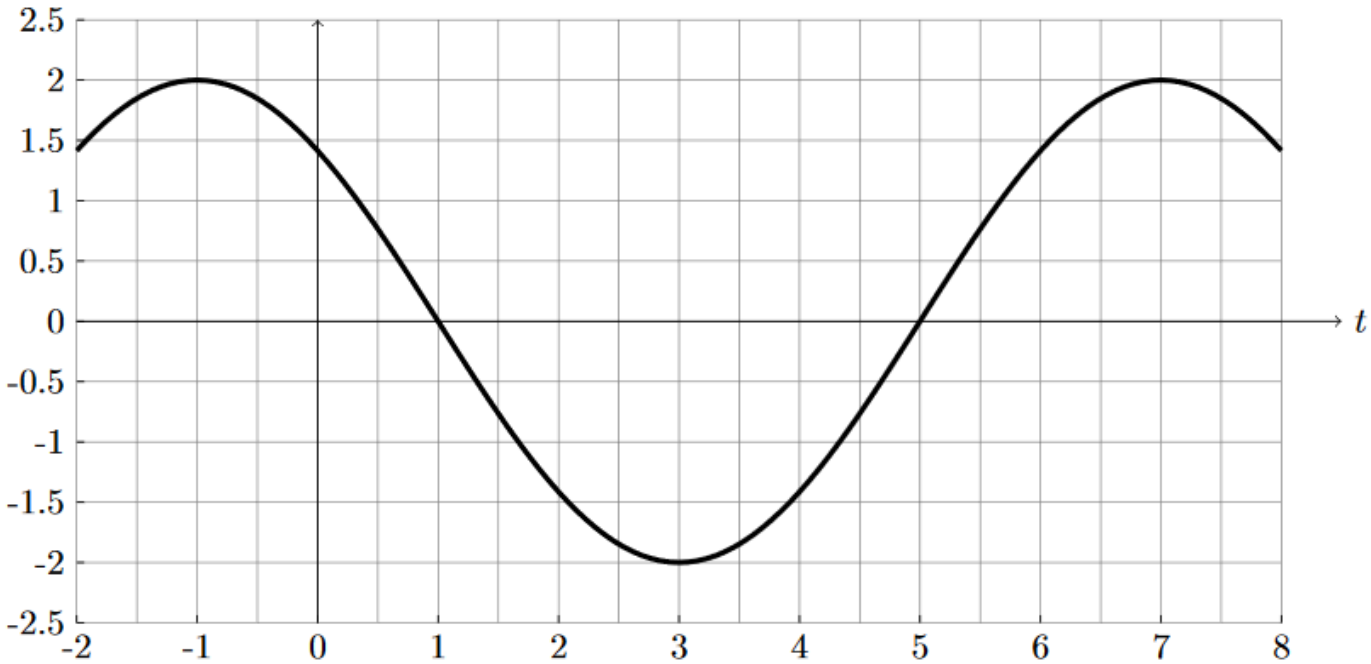

Fig. 1. Mystery sinusoid.

The graph of a sinusoidal function is displayed. The problem is to express it in the *standard form*

$$f(t) = A\cos(\omega t - \phi).$$

Constant coefficient linear ODEs

We define a constant coefficient linear ODE as of the form

$$\dot{y} + ky = q(t), \tag{2}$$

with particular and homogeneous solutions

$$y_p(t) = e^{-kt} \int e^{kt} q(t)\, dt \tag{3}$$

$$y_h(t) = e^{-kt} \tag{4}$$