

Homework No. 10 (2019 Spring)

PHYS 301: Theoretical Methods in Physics

Due date: Monday, 2019 Apr 8, 9:00 AM, in class

1. **(20 points.)** A critically damped harmonic oscillator is described by the differential equation

$$\left[\frac{d^2}{dt^2} + 2\omega_0 \frac{d}{dt} + \omega_0^2 \right] x(t) = 0, \quad (1)$$

where ω_0 is a characteristic frequency. Find the solution $x(t)$ for initial conditions $x(0) = x_0$ and $\dot{x}(0) = 0$. Plot $x(t)$ as a function of t in the following graph where $x_0 e^{-\omega_0 t}$ is already plotted for reference. For what t is the solution $x(t)$ a maximum?

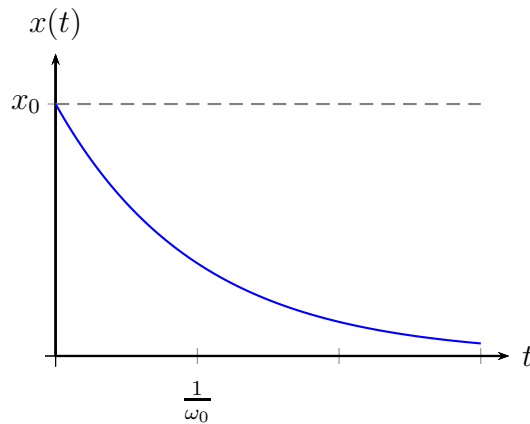


Figure 1: Critically damped harmonic oscillator.