MAP 2302 Elementary Ordinary Differential Equations

Homework Assignment # E, Due March 16, 2016

1) A 4 pound weight is attached to the lower end of a coil spring which hangs vertically from a fixed support. The weight comes to rest in its equilibrium position, thereby stretching the spring 6 inches (from this you can calculate the spring constant k). The weight is then pulled down 3 inches below this equilibrium position and released at time $t = 0$. The medium offers a resistance in pounds numerically equal to $a\frac{dx}{dt}$, where $a > 0$ and $\frac{dx}{dt}$ is the instantaneous velocity in feet per second.

a) Determine the value of the constant a such that the resulting motion would be critically damped in this system, and determine the resulting displacement of the weight as a function of time for *this* critical value of a.

b) Determine the resulting displacement of the weight as a function of time if now a is equal to one-half the critical value found in part (a).

c) Determine the resulting displacement of the weight as a function of time if now a is equal to twice the critical value found in part (a).

From the text:

Section 5.1: Problems 5, 13, 21, 23, 27, 35, 37, 39(a)