

Homework 1 – Linear ODEs and Allometric **Due Fri. 9/13**

Work all problems in WeBWorK and attach any written parts to this assignment.

1. Solve

$$\frac{dy}{dx} + 2xy = f(x), \quad y(0) = 2$$

where

$$f(x) = \begin{cases} x, & 0 \leq x < 1 \\ 0, & x \geq 1 \end{cases}$$

2. Consider the equation

$$\dot{x} + p(t)x = 0.$$

Suppose that $p(t)$ is periodic with period T , *i.e.*, $p(t + T) = p(t)$. Show that the solution $x(t)$ for any initial condition is periodic if and only if

$$\int_0^T p(s)ds = 0.$$

Said another way, you are showing that if $p(t)$ has zero average in time, then the solution will be periodic.