

Problems from December 2, 2011

1. Show that  $y = x - x^{-1}$  is a solution of the differential equation  $xy' + y = 2x$ .
2. Verify that  $y = \sin(x)\cos(x) - \cos(x)$  is a solution of the initial value problem  $y' + (\tan x)y = \cos^2 x$  and  $y(0) = 1$  on the interval  $-\pi/2 < x < \pi/2$ .
3. Remember in class we showed that the spring mass system was governed by the differential equation  $mx'' = -kx$ .
  - (a) For what values of  $k$  does the function  $x = \cos(kt)$  satisfy the differential equation  $4x'' = -25x$ ?
  - (b) For those values of  $k$ , verify that every member of the family of functions  $x = A \sin(kt) + B \cos(kt)$  is also a solution.
4. Which of the following functions are solutions of the differential equation  $y'' + y = \sin(x)$ ?
  - (a)  $y = \sin x$
  - (b)  $y = \cos x$
  - (c)  $y = \frac{1}{2}x \sin x$
  - (d)  $y = -\frac{1}{2}x \cos x$