

Introduction to Differential Equations – Math 286 X1
Fall 2009
Homework 1 — due September 2

1. Verify in each case that the given function is a solution to the differential equation.

(a) $y' = 5x^4$, $y(x) = x^5 + 7$,

(b) $y' = y + 2e^{-x}$, $y(x) = e^x - e^{-x}$,

(c) $y'' + 4y = 0$, $y(x) = 7\cos(2x) - 3\sin(2x)$,

(d) $y' + 2xy^2 = 0$, $y(x) = (1 + x^2)^{-1}$.

2. In each case, first verify that the given function satisfies the differential equation, then compute the correct value of C so that it also satisfies the initial condition.

(a) $y' + y = 0$, $y(x) = Ce^{-x}$, $y(0) = 3$,

(b) $y' + 2xy = 0$, $y(x) = Ce^{-x^2}$, $y(0) = -1$,

(c) $y' = x - y$, $y(x) = Ce^{-x} + x - 1$, $y(0) = 1$.

3. For each of these equation, use your knowledge of derivatives to make an intelligent guess for the solution. Check your guess.

(a) $y'' = 0$,

(b) $y' = 3y$,

(c) $(y')^2 + y^2 = 1$.