Worksheet 08

MATH 16B GSI:TAO SU TU 10/24/2017

1. Solve the following differential equations.
(a) $y' = \cos(x) - y$
(b) $(x^2+1)\frac{dy}{dx} + 3x(y-1) = 0, y(0) = 2$

2. Given the differential equation $y' = y^3 - 9y$ with each of the following initial conditions: $y(0) = -4; y(0) = -1; y(0) = 2; y(0) = 6$, sketch the graphs of the corresponding solutions.

3. You make an initial deposit of \$500 in a savings account and plan on making future deposits at a gradually increasing annual rate given by $90t + 810$ dollars per year, t years after the initial deposit. Assume that the deposits are made continuously and that interest is compounded continuously at the rate of 6%. Let $P(t)$ denote the amount of money in the account.
Set up an initial-value problem that is satisfied by $P(t)$. Do not solve the initial-value problem.

4. (a) For information being spread by mass media, the rate of spread of the information is proportional to the percentage of the population not having the information at that time.
(b) For information being spread by individual contact, the rate of spread of the information is proportional to the product of the percentage of the population who know and the percentage who don't.
Let $f(t)$ be the percentage of the population having the information at time t. Assume that $f(0) = 1$, i.e. initially one percent of the population has the information.
In each case, set up a differential equation to model $y = f(t)$. Do not solve the differential equation.

5. Draw the solution curves of the differential equation $yy' + x = 0((x, y) \neq (0, 0))$.