

DUE: 22 February 2011

Please answer these questions on a separate piece of paper.
To receive full credit, you must show your work!!!

1. Find the general solution to the following ODEs:

(a) $\frac{dy}{dt} = ty$

(d) $\frac{dx}{dt} = 1 + x^2$

(b) $\frac{dy}{dt} = t^4y$

(e) $\frac{dy}{dt} = \frac{t}{t^2y+y}$

(c) $\frac{dy}{dt} = e^{-y}$

(f) $\frac{dy}{dt} = t\sqrt[3]{y}$

2. Solve the initial value problems:

(a) $\frac{dy}{dt} = -y^2; \quad y(0) = 0$

(d) $\frac{dy}{dt} = t^2y^3; \quad y(0) = -1$

(b) $\frac{dy}{dt} = -y^2; \quad y(0) = \frac{1}{2}$

(e) $\frac{dy}{dt} = \frac{t}{y-t^2y}; \quad y(0) = 4$

(c) $\frac{dy}{dt} = 2y + 1; \quad y(0) = 3$

(f) $\frac{dx}{dt} = \frac{t^2}{x+t^3x}; \quad x(0) = -2$

Bonus (*You Must Attempt!*)

A Savings Model

- (a) Anne deposited \$5000 into a money market account with an interest rate of 2% compounded continuously. Let $A(t)$ denote the amount of money in the account at time t , thus our differential equation for A is:

$$\frac{dA}{dt} = 0.02A$$

How much money will be in the account in 10 years?

- (b) Anne has decided that after 10 years, she will withdraw \$500 a year (in a continuous manner, thus we can treat this as a continuous differential equation). How long from now until she is out of money? Will she ever?