

Math 3280 Assignment 1, due September 1st.

You should read sections 1.1 and 1.2 in the text (Edwards and Penney). In general it is a very good idea to read the corresponding sections of the textbook before doing assignments for this class.

- (1) Verify that the given function  $y(x)$  is a solution to the differential equation by substitution for each of the problems below.

(a)  $y' = 4x^3$ ,  $y = x^4 + 27$ .

(b)  $y' = -3y$ ,  $y = 2e^{-3x}$ .

- (2) Find all solutions of the form  $y = e^{rx}$  to the differential equations below by substitution (here  $r$  is a real constant).

(a)  $3y'' - 4y' - 4y = 0$ .

(b)  $4y'' = y$ .

- (3) Determine a value of the constant  $C$  so that the given solution of the differential equation satisfies the initial condition.

(a)  $y = \ln(x + C)$  solves  $e^y y' = 1$ ,  $y(0) = 1$ .

(b)  $y = Ce^{-x} + x - 1$  solves  $y' = x - y$ ,  $y(0) = 3$ .

- (4) Write a differential equation for a population  $P$  that is changing in time ( $t$ ) such that the rate of change is proportional to the square root of  $P$ .

- (5) Solve the following initial value problems.

(a)  $\frac{dy}{dx} = 3x + 1$ ,  $y(0) = 1$ .

(b)  $\frac{dy}{dx} = \sqrt{x}$ ,  $y(9) = 0$ .

(c)  $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$ ,  $y(0) = 0$ .

(d)  $\frac{dy}{dx} = xe^{-x}$ ,  $y(0) = 2$ .