1. (25 points) Suppose that you borrow 150,000 dollars to buy a house at 9 percent annual interest rate, compounded continuously. 
(a) (15 points) What are you monthly payments, assuming a 30-year loan? 
(b) (10 points) How much interest do you pay in total? 

2. (30 points) Solve the following differential equations. 
(a) (15 points) \(e^t(y - t) + (1 + e^t)y' = 0\). 
(b) (15 points) \(x' + x = t^2\) with \(x(0) = 0\). 

3. (45 points) Let \(x' + x = t\). 
(a) (10 points) Let \(x(0) = x_0\). Find the general solution. 
(b) (5 points) Identify the transient and steady-state parts of the solution. 
(c) (20 points) Suppose that the actual initial condition is \(x_0 = 1\) and the measured initial condition is \(\hat{x}_0 = 2\). Find the absolute error \(E_a\) and relative error \(E_r\). 
(d) (10 points) Find \(\lim_{t \to \infty} E_a\) and \(\lim_{t \to \infty} E_r\).