MATH 1B Fall 2015
Section 16 Name: _____

Population growth problem, linear equation practice.
The electric circuit problem is governed by the equation:

$$L\frac{dI}{dt} + RI = E(t).$$

1. Suppose a population $P(t)$ satisfies:

$$\frac{dP}{dt} = 0.4P - 0.001P^2, \quad P(0) = 50,$$

where t is measured in years:
(a) What is the carrying capacity?
(b) What is $P'(0)$?
(c) When will the population reach 50% of the carrying capacity?

Solve the differential equations:

2. $xy' + y = \sqrt{x}$

3. $\sin x\frac{dy}{dx} + \cos xy = \sin x^2$

4. $x\frac{dy}{dx} - 4y = x^4e^x.$

5. $t^3\frac{dy}{dt} + 3t^2y = \cos t, \quad y(\pi) = 0.$

6. $2xy' + y = 6x, \quad x > 0, \quad y(4) = 20.$

7. $(x^2+1)\frac{dy}{dx} + 3x(y-1) = 0, \quad y(0) = 2.$

8. Solve for the current in a simple circuit where $E(t) = 40\sin 60t$, inductance $= 1H$, the resistance $= 20\Omega$, $I(0) = 1A$.