34. Solve the Bernoulli equations in Problem 37 and 38 of Section 2.3 in the textbook.

35. A tank has ten gallons of water in which two pounds of salt has been dissolved. Brine with 1.5 pound of salt per gallon enters at three gallons per minute, and the well-stirred mixture is drained out at a rate of four gallons per minute. Find the amount of salt in the tank at any time.

36. Assume $y : (0, \infty) \to (0, \infty)$ is continuous with $\int_1^x \frac{y(t)}{t} \mathrm{d}t = y(x) - \frac{x^2+1}{2}$ for all $x > 0$. Find y.

37. Let $N(t)$ be the number of individuals in a certain population at time t.

    (a) If we assume that N increases proportionally to the number of individuals currently present, give a differential equation for N and solve it. For an initial condition, assume that at time 0 the number of individuals is N_0.

    (b) Characterize the increasing, decreasing, and constant solutions from (a). Sketch the solutions. Find the limit of $N(t)$ as $t \to \infty$. Give an interpretation of all of your results.

    (c) Now we assume that N changes proportionally to the product of the number of individuals currently present and $(1 - \frac{N(t)}{K})$, where K is a constant. Give the corresponding ODE.

    (d) Solve the differential equation from (c) by separating the variables. For an initial condition, make the same assumption than in (a).

    (e) Characterize the increasing, decreasing, and constant solutions from (d). Sketch the solutions. Also, find the limit of $N(t)$ as $t \to \infty$. Give an interpretation of all of your results.

38. Read Section 2.5 of the textbook and use Euler's method to work on Problems 3–6.