1. Suppose a snowball has radius r_0 at time 0. As time goes by, the volume of the snowball is decreasing proportionally to its surface area. Find the radius $r(t)$ of the snowball at time $t > 0$. (Hint: A ball of radius r has volume $\frac{4}{3}\pi r^3$ and surface area $4\pi r^2$.)
2. Solve the initial value problem $y' - 3t^2 y = t^2$, $y(0) = 1$.
3. Given are two tanks containing 50 gallons of water each. At time 0, the first tank contains 1 lb of dye thoroughly mixed, and there is no dye in the second tank. Now, water is entering the first tank at a rate of 5 gallons per minute. From the first tank water is flowing into the second tank at a rate of 5 gallons per minute. And water is leaving the second tank, also at a rate of 5 gallons per minute.
   (a) Draw a picture.
   (b) Determine the amount of dye in the first tank at time t.
   (c) Determine the amount of dye in the second tank at time t.
4. Separate the variables to solve the initial value problem $P' = 2P - 2tP$, $P(0) = 5$.
5. In 1920, R. Pearl used experiments to show that the rate of change in a population of the fruit fly "drosophila" is equal to $\frac{1}{5}P(t) - \frac{1}{5175}P^2(t)$, where $P(t)$ is the quantity of the population after t days. Assume that we have 10 flies at time 0.
   (a) Find $P(t)$ for $t > 0$.
   (b) How many flies are there after 12 days?
   (c) Find the limit of $P(t)$ as $t \to \infty$ and give an interpretation of your result.