<u>Ex</u> 50 lbs of salt is dissolved in a tank holding 300 gallons of water. A brine solution containing 2 lbs of salt/gallon is pumped into the tank at a rate of 3 gallons per minute. The solution is well mixed in the tank and leaves at the same rate.

(a). Determine the amount of salt in the tank at time t.

(b). How much salt is present after 50 minutes?

(c). How much salt is present after a long time (i.e. $t \to \infty$)?

<u>Ex</u> Same problem, except the brine solution is being pumped in at a rate of 5 gallons per minute. The well-mixed solution is still being pumped out at 3 gallons per minute.

(a). Determine the amount of salt in the tank at time t.

(b). How much salt is present after a long time (i.e. $t \to \infty$)? Does the answer make sense?

Ex Suppose an initial amount S_0 is deposited into a fund that pays interest at an annual rate of r. If the interest is compounded continuously, then the rate of change of the investment is proportional to the amount invested. Set up and solve the differential equation for the amount of the investment.

Ex Suppose \$1000 is invested at an annual rate of 1.5% and compounded continuously.

(a). Find the amount after t years.

(b). Find the amount after 3 years.

(c). How long will it take for the investment to grow by 10%?

1. Given the differential equation describing the motion of an object thrown straight upward and falling under the influence of gravity and air resistance (proportional to the velocity) is given by

$$m\frac{dv}{dt} = mg - bv, \quad v(0) = v_0$$

(a). (Homework) Solve this problem using Integrating Factor.
[Note: This equation was solved in Section 2.2 using Separation of Variables: $v(t) = \frac{mg}{b} + \left(v_0 - \frac{mg}{b}\right) e^{-\frac{b}{m}t}$]

(b). Determine the terminal (or limiting) velocity as $t \to \infty$.

(c). Sketch a graph of $v(t)$ and the limiting velocity on the same graph.
[You may use Maple or your calculator. Choose reasonable values for $m, b, \& \, g = 9.8$ or 32]

(d). Find the position of the object $x(t)$ if the initial position is $x(0) = x_0$.

Determine the function that $x(t)$ approaches as $t \to \infty$

(e). Sketch the graph of $x(t)$ and the limiting function found in part(d) on the same graph.
[You may use Maple or your calculator. Choose reasonable values for $m, b, \& \, g = 9.8$ or 32]

Homework: Part(a) above and Section 2.3, p. 47: #1, 2, 3, 15, 5, 6, 12, 14, 16, 17