1. Balance the following chemical reaction:
$$CH_3 + O_2 \rightarrow CO_2 + H_2O$$
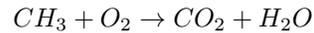
2. Consider the two tanks shown in the figure. Suppose that tank A contains 50 gallons of water in which 25 pounds of salt is dissolved. Suppose tank B contains 50 gallons of pure water. Liquid is pumped in and out of the tanks as indicated; the mixture is assumed to be well-stirred. Construct and solve a mathematical model that described the number of pounds $x_1(t)$ and $x_2(t)$ of salt in tanks A and B, respectively, at time t.

3. The equation for the displacement x(t) of a particle of mass m acted on by the force of gravity and a resistance proportional to the velocity is given by:
$$\frac{d^2x}{dt^2} + b\frac{dx}{dt} = g \qquad x(0) = 0 \quad \dot{x}(0) = v_0$$

Solve using Laplace transforms.

4. Solve the ODE describing the axial (x) variation of concentration c in a reactor:

$$\frac{d^2c}{dx^2} - \frac{dc}{dx} - 6c = 0$$

with boundary conditions:

$$x = 0: \quad \frac{dc}{dx} = (c - 1) \qquad \text{and} \qquad x = 1: \quad \frac{dc}{dx} = 0$$