Separable and Linear Equations (2.1, 2.2)

1. Solve the ODE: $\dfrac{dy}{dx} = \dfrac{x^2}{1+y^2}$

2. Solve the ODE: $\dfrac{dy}{dx} = xe^{x+y}$

3. Solve the ODE: $ty' + 2y = \sin t, \quad t > 0$

4. Solve the IVP: $y' - 2y = e^{2t}, \quad y(0) = 2$

5. Solve the IVP: $ty' + (t+1)y = t, \quad y(\ln 2) = 1, \quad t > 0$

Modelling with 1st Order Equations (2.3)

1. A tank originally contains 40 gal of water with 5 lb of salt in solution. Water containing $\frac{1}{10}$ lb of salt per gallon is entering at a rate of 2 gal/min, and the well-stirred solution in the tank is leaving at the same rate.

a. Write down the differential equation for $Q(t)$, the amount of salt in the tank.

b. Write the initial value problem for $Q(t)$.

c. Find $Q(t)$ by solving the initial value problem.