# Worksheet 3/25/2026

1) Consider two interconnected tanks. Tank 1 initially contains 30 gal of water and 2 lbs of salt. Tank 2 initially contains 20 gal of water and 1 lbs of salt. Fresh water is pumped into tank 1 at a rate of 1 gal/min. The mixture in tank 1 is pumped into tank 2 at a rate of 2 gal/min. The mixture in tank 2 is pumped back to tank 1 at a rate of 1 gal/min. At the same time, tank 2 is drained a rate of 1 gal/min. Write a system of ODEs that describes the amount of salt at each tank together with the initial conditions.

2) Convert the system of ODEs into a single ODE together with suitable initial conditions.

$$\begin{cases} y_1' &= y_1 + y_2 \\ y_2' &= -y_1 + 2y_2 \end{cases}, \quad y_1(0) = 2, \quad y_2(0) = 1$$

3) Write the above system in terms of a differential equation of vectors.