Separable equations, orthogonal trajectories, mixing problems.

1. Solve $(y + \sin y)y' = x + x^3$

2. Solve $(y^2 + xy^2)y' = 1$

3. Solve $\dfrac{dy}{dt} = \dfrac{t}{ye^{y+t^2}}$

Find orthogonal trajectories:

4. $x^2 + 2y^2 = k^2$

5. $y = \dfrac{x}{1 + kx}$

6. $\displaystyle\int y^2 = kx^3$

7. A tank contains 1000L of brine with 15Kg of dissolved salt. Pure water enters the tank at a rate of 10L/min. The solution is kept thoroughly mixed and drains from the tank at the same rate. How much salt is in the tank after t minutes?