

## MA 16020 Lesson 8: Separation of variables III

**Exercise 1.** Find the general solution to the differential equations.

(a)  $6x^3y' = 2y' + x^2e^{-4y}$

(b)  $t^2y' = 5t^3 + 12t^3y$

**Exercise 2.** Find the general solution to the differential equation

$$y' = \sin(3x)\sqrt{3y}.$$

**Exercise 3.** A 800-gallon tank initially contains 600 gallons of pure water. Brine containing 2 pounds of salt per gallon flows into the tank at the rate of 3 gallons per minute, and the well-stirred mixture flows out of the tank at the rate of 3 gallons per minute. What is the amount of salt in the tank after 10 minutes?

**Exercise 4.** In the previous problem, assume that the mixture flows out only at the rate of 2 gallons per minute. Set up a differential equation describing the amount of salt in the tank after  $t$  minutes. Is the equation separable?