

## Math 11B Discussion Section

With your group, take a look at the previous week's worksheet questions about separable equations. Describe what makes them separable, and make sure you can start the problem by separating variables.

- (1) (a) Solve the differential equation  $y' = 2x\sqrt{1 - y^2}$ .  
(b) Solve the initial-value problem  $y' = 2x\sqrt{1 - y^2}$ ,  $y(0) = 2$ , and graph the solution.  
(c) Does the initial-value problem  $y' = 2x\sqrt{1 - y^2}$ ,  $y(0) = 2$ , have a solution? Explain.
- (2) Solve the equation  $y' = x\sqrt{x^2 + 1}/(ye^y)$ , and graph several members of the family (e.g. on Desmos). How does the solution curve change as the constant  $C$  varies?
- (3) Consider the system
$$\begin{cases} x = 3t - 5 \\ y = 2t + 1 \end{cases}$$
  - (a) Sketch the curve by using the parametric equations to plot points. Indicate with an arrow the direction in which the curve is traced as  $t$  increases.
  - (b) Eliminate the parameter to find a Cartesian equation of the curve.
- (4) For each predator-prey system, determine which of the variables,  $x$  or  $y$ , represents the prey population and which represents the predator population. Is the growth of the prey restricted just by the predators or by other factors as well? Do the predators feed only on the prey or do they have additional food sources? Explain.
  - (a)  $\frac{dx}{dt} = -0.05x + 0.0001xy$   
 $\frac{dy}{dt} = 0.1y - 0.005xy$
  - (b)  $\frac{dx}{dt} = -0.2x + 0.0002x^2 - 0.006xy$   
 $\frac{dy}{dt} = -0.015 + 0.00008xy$

