

# MAT 137 (Calculus II) Prof. Swift

## Worksheet on the Interval of Existence

1. Use separation of variables to find the solution to the initial value problem  $\frac{dy}{dt} = y^2$ ,  $y(0) = 1$ . Note that  $t$ , not  $x$ , is the independent variable. This ODE is sometimes called the “explosion equation”.
2. Find the interval of existence of the solution, and sketch the solution. You might want to use the slope field app on your phone or tablet to help. Note that the union of two intervals, like  $(-\infty, 0) \cup (0, \infty)$ , is *not* an interval.
3. For an arbitrary  $y_0 > 0$ , solve the initial value problem  $\frac{dy}{dt} = y^2$ ,  $y(0) = y_0$ .
4. Find the interval of existence of the solution in problem 3. Note that the interval depends on  $y_0$ .