

MAT 239 (Differential Equations) Prof. Swift

Quiz 1, First Order ODEs, Inspection and Separation of Variables

Name: Key

Do your own work. You may not use notes or any electronic devices. In problems 1 and 2, you may solve by inspection. Problem 3 requires separation of variables, and is worth twice the points of the others. Continue on the back of the page if needed.

1. Find the general solution to $\frac{dy}{dx} = 2y$.

$$y = Ce^{2x}$$

2. Solve the initial value problem (IVP) $\frac{dy}{dx} = 2y, y(0) = 3$. (Same ODE as prob 1.)

$$y = 3e^{2x}$$

3. Find the solution to the IVP $\frac{dy}{dx} = \frac{1}{e^y}, y(0) = 0$. Indicate the interval of existence of the solution.

$$\int e^y dy = \int dx \rightarrow e^y = x + c$$

$$e^0 = 0 + c \implies 1 = c \implies e^y = x + 1$$

Solution to IVP $y = \ln(x+1)$

general solution $y = \ln(x+c)$

~~Domain~~ Interval of existence is $x+1 > 0$ or $x > -1$, or $(-1, \infty)$