

Written HW17 – MATH 2501 Fall 2021

Due by 1 November for timely completion credit

In this problem, you will solve the differential equation

$$\frac{dy}{dt} = y(t). \quad (1)$$

By algebra, we can think of this equation as

$$\frac{y'(t)}{y(t)} = 1 \quad (2)$$

1. Let $f(x)$ be an unknown function and calculate $\frac{d}{dt} \ln(f(t))$. Your answer should include both $f(t)$ and $f'(t)$.
2. Use your result above to determine the antiderivative(s) of $D^{-1} \left(\frac{f'(t)}{f(t)} \right)$.
3. Use your result above to find the antiderivative(s) (with respect to the variable t) of both sides of equation (2) (*note: take $f(t) = y(t)$ here*).
4. Solve the equation resulting from the previous problem for the function $y(t)$. What you have just found is called “the general solution of the differential equation (1)”.
5. Consider the initial value problem

$$\frac{dy}{dt} = y(t), \quad y(1) = 15.$$

Use your answer to the previous question to solve this initial value problem by finding the unknown constant.