

Quiz # 3– Math 2233, Differential Equations – Sep. 11, 2008

1. Solve the equation

$$y'' - (y')^2 = 0$$

Hint: Set $v = y'$.

Solution: By setting $v = y'$, we have $v' = y''$. Then the equation can be written as

$$v' - v^2 = 0$$

It is a separable equation and

$$\begin{aligned}v' - v^2 = 0 &\Rightarrow \frac{dv}{dt} = v^2 \\&\Rightarrow \frac{1}{v^2} dv = dt \\&\Rightarrow -\frac{1}{v} = t + C_1 \\&\Rightarrow v = -\frac{1}{t + C_1}\end{aligned}$$

Since $v = y'$, then we have

$$\begin{aligned}y' = -\frac{1}{t + C_1} &\Rightarrow y = \int -\frac{1}{t + C_1} dt \\&\Rightarrow y = -\ln |t + C_1| + C_2\end{aligned}$$

The solution is

$$y = -\ln |t + C_1| + C_2$$