

Q.232 #9

$$y = \frac{5}{2}(e^{\frac{x}{5}} + e^{-\frac{x}{5}}) \quad , y'' = \frac{y}{25}$$

$$y' = \frac{5}{2} \left( e^{\frac{x}{5}} \cdot \frac{1}{5} + e^{-\frac{x}{5}} \cdot \left(-\frac{1}{5}\right) \right)$$

$$y'' = \frac{5}{2} \left( e^{\frac{x}{5}} \cdot \frac{1}{5} \cdot \frac{1}{5} + e^{-\frac{x}{5}} \cdot \left(-\frac{1}{5}\right) \cdot \left(-\frac{1}{5}\right) \right)$$

$$y'' = \frac{5}{2} \left( \frac{1}{25} e^{\frac{x}{5}} + \frac{1}{25} e^{-\frac{x}{5}} \right)$$

$$= \frac{1}{25} \cdot \frac{5}{2} \left( e^{\frac{x}{5}} + e^{-\frac{x}{5}} \right)$$

$$= \frac{y}{25}$$

$$12) N(t) = 1000 \left[ 30 + e^{-\frac{t}{30}} \right]$$

$$a) N(0) = 1000 \left[ 30 + e^{-\frac{0}{30}} \right] \\ = 31000$$

$$b) N'(t) = 1000 \left[ e^{-\frac{t}{30}} \cdot -\frac{1}{30} \right]$$

$$c) N'(20) = 1000 \left[ e^{-\frac{20}{30}} \cdot -\frac{1}{30} \right] \\ = -17.1$$

$$d) 0 = 1000 \left[ e^{-\frac{t}{30}} \cdot -\frac{1}{30} \right]$$

$$e^{-\frac{t}{30}} = 0$$

$$t = \text{DNE}$$

$$0 \leq t \leq 50$$

$$\textcircled{\text{@ } t=0 \quad N(t) = 31000}$$

## *Lesson 2: Derivative of the Natural Log*

 <https://www.youtube.com/watch?v=fmKqJ69YaTk>

Example 4: Differentiate. Do not simplify.

$$a) y = (e^x)(\ln x) \quad y' = (e^x)(\ln x) + (e^x)\left(\frac{1}{x}\right)$$

$$b) y = (1 + \sqrt{\ln x})^5 \quad y' = 5(1 + (\ln x)^{1/2})^4 \left(0 + \frac{1}{2}(\ln x)^{-1/2} \left(\frac{1}{x}\right)\right)$$
$$y = (1 + (\ln x)^{1/2})^5$$

$$c) y = 5^x$$

$$y' = \ln 5 \cdot 5^x$$