

QUIZ 9 (Pg. 644 #39)

Let A = the amount of salt in the tank at time t .

$$\frac{dA}{dt} = (\text{rate in}) - (\text{rate out}) = (0) - \left(\frac{A}{1000} \cdot 10\right)$$

Part a)

$$\frac{dA}{dt} = \frac{-A}{100} \rightarrow 100 dA = -A dt$$

$$\rightarrow \frac{1}{A} dA = \frac{-1}{100} dt$$

$$\rightarrow \int \frac{1}{A} dA = \int \frac{-1}{100} dt$$

$$\rightarrow \ln|A| = \frac{-1}{100} t + C$$

$$\rightarrow e^{\ln|A|} = e^{\frac{-1}{100} t + C}$$

$$\rightarrow |A| = C_1 e^{\frac{-1}{100} t} \quad \text{where } C_1 = e^C$$

$$\rightarrow A = \pm C_1 e^{\frac{-1}{100} t}$$

$$\rightarrow A = C_2 e^{\frac{-1}{100} t}$$

we know $A(0) = 15$ so $C_2 = 15$

$$\rightarrow A = 15 e^{\frac{-1}{100} t}$$

Part b) $A(20) = 15 e^{\frac{-1}{5}} \approx 12.281$ kg. of salt