

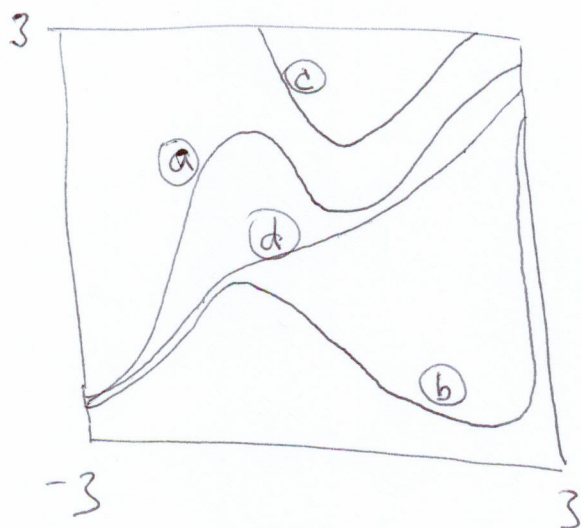
$$1) \frac{dA}{dt} = \dot{R}_{in} - \dot{R}_{out}$$

$$= \frac{5}{8} \cdot 2 - \frac{10 \left(\frac{\text{gal}}{\text{min}} \right) \cdot A(\text{lb})}{500 - 5t \text{ (gal)}} \quad (5)$$

$$\Rightarrow A(t) = 1000 - 10t - \frac{1}{10} (100 - t^2) \quad (5)$$

Tank will be empty in 100 minutes. (5)

2)



(20)

$$3a) y = \frac{1}{2} x^{-2} e^x + C \cdot x^{-2} e^{-x} \quad (5), \quad x \in (0, \infty) \quad (5)$$

$$3b) \text{ inexact } \xrightarrow{\text{I.F.}} \text{ exact } \Rightarrow e^{y^2} (x^2 + 4) = 20 \quad (5)$$

$$4a) (\text{homogeneous coeff's} \Rightarrow \text{subs. } y = ux) \quad (10)$$

$$\ln(x^2 + y^2) + 2 \tan^{-1}(y/x) = C$$

$$4b) (\text{Bernoulli eqn} \Rightarrow \text{subs: } u = y^{-3}) \quad (10)$$

$$u^{-3} = v + \frac{1}{2} + \ln 3x$$