

Name:

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MATH-202

Term-072

QUIZ-2

Form(A)

- 1) A tank contains 600 liters of fluid in which 50 grams of salt is dissolved. Brine containing 2 gram of salt per liter is then pumped into the tank at a rate of 6 L/min; the well-mixed solution is pumped out at the same rate. What is the concentration of the salt in the tank after 20 min?

$$\frac{dA}{dt} = R_{in} - R_{out}$$

$$R_{in} = \left(2 \frac{\text{gram}}{\text{liter}}\right) * \left(6 \frac{\text{liter}}{\text{min}}\right) = 12 \text{ gram/min}$$

$$R_{out} = \left(\frac{A(t)}{600} \frac{\text{gram}}{\text{liter}}\right) * \left(6 \frac{\text{liter}}{\text{min}}\right) = \frac{A(t)}{100} \text{ gram/min}$$

$$\boxed{\frac{dA}{dt} = 12 - \frac{A}{100}, \quad A(0) = 50}$$

$$\frac{dA}{1200-A} = \frac{dt}{100} \Rightarrow -\ln|1200-A| = \frac{t}{100} + C$$

$$\Rightarrow (1200-A) = ce^{-\frac{t}{100}} \Rightarrow \boxed{A(t) = 1200 - ce^{-\frac{t}{100}}}$$

$$50 = A(0) \Rightarrow 50 = 1200 - c \Rightarrow c = 1150$$

$$\boxed{A(t) = 1200 - 1150 e^{-\frac{t}{100}}}$$

$$\text{After 20 min} \Rightarrow \text{amount of salt} = A(20) = 1200 - 1150 e^{-\frac{20}{100}} \\ = 1200 - 1150 (0.8187) = 258.49$$

$$\Rightarrow \text{Concentration of the salt in the tank after 20 min} \\ = \frac{258.49}{600} = 0.4308 \text{ gram/liter}$$

$$\text{FORM B: After 10 min} \Rightarrow A(10) = 1200 - 1150 e^{-\frac{10}{100}} = 159.43$$

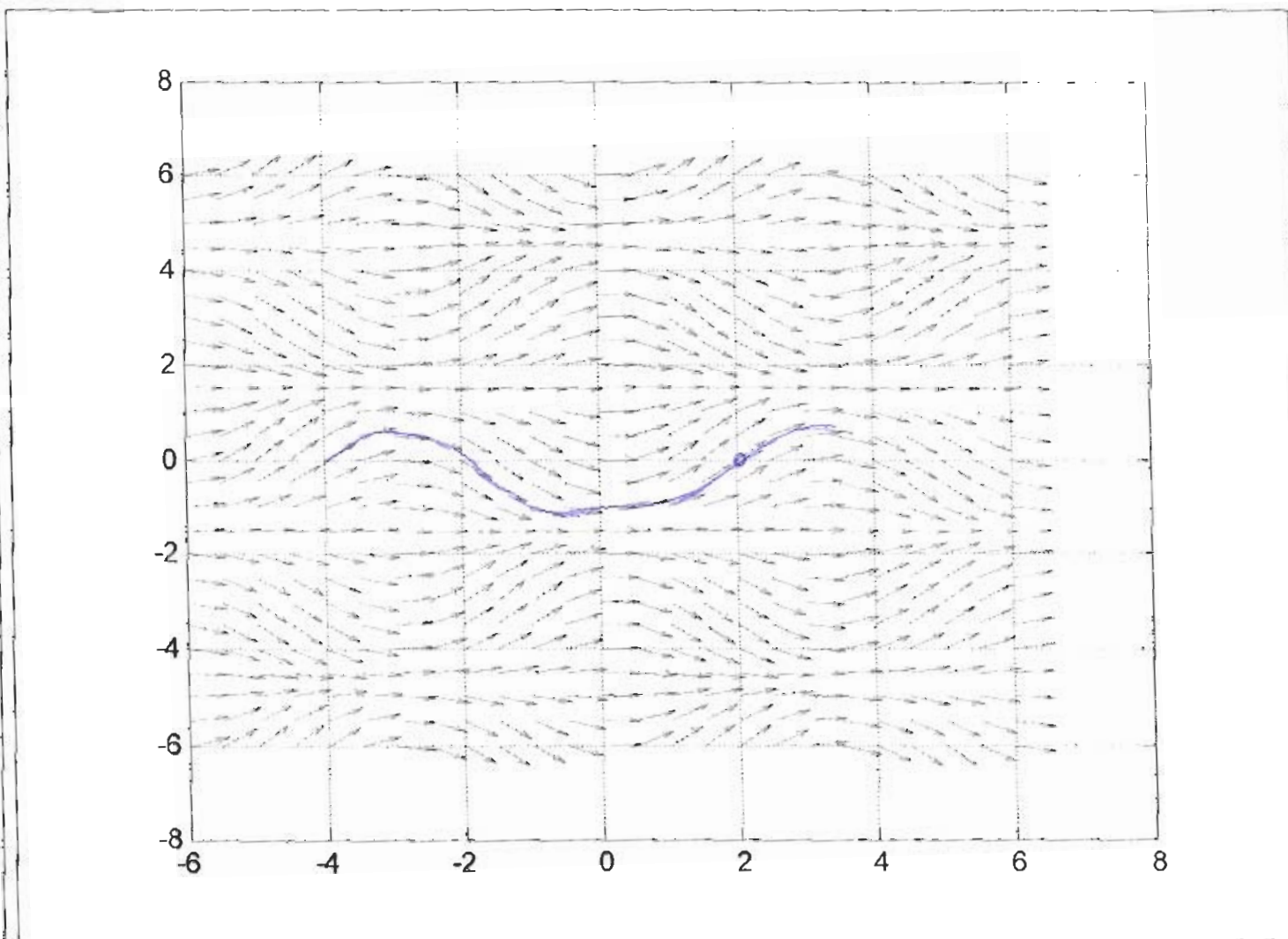
$$\Rightarrow \text{concentration} = \frac{159.43}{600} = 0.2657 \text{ gram/liter}$$

2) Consider the following IVP:

$$\frac{dy}{dx} = (\sin x)(\cos y)$$
$$y(-4) = 0$$

Figure(1) displays the computer-generated direction field. Use Figure(1) to estimate the value of $y(2)$.

[[Hint: sketch by hand an approximate solution curve that passes through the initial condition then use this curve to estimate the value]]



$y(2) \cong$	0
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FORM (A)

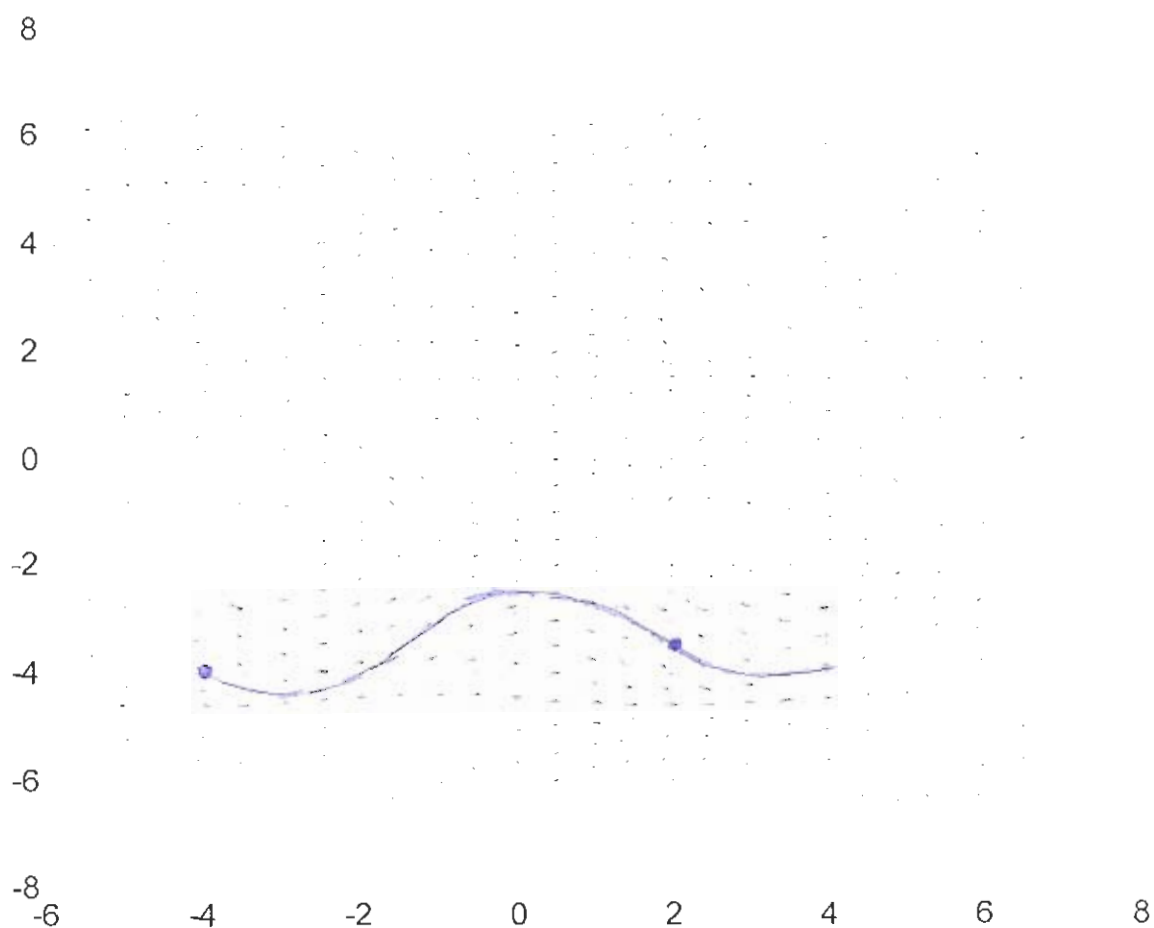
2) Consider the following IVP:

$$\frac{dy}{dx} = (\sin x)(\cos y)$$

$$y(-4) = -4$$

Figure(1) displays the computer-generated direction field. Use Figure(1) to estimate the value of $y(2)$.

[Hint: sketch by hand an approximate solution curve that passes through the initial condition then use this curve to estimate the value]



$$y(2) \cong$$

$$-3.5$$

FORM(B)