

MODEL: B

KING ABDULAZIZ UNIVERSITY
DEPARTMENT OF MATHEMATICS
Exam/Course: Exam I - Math-204

Student Name:

Student University Number:

Instructor Name:

Section:

Time Allowed: 90 Minutes

March 27, 2011

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(Q1) Select the correct response with writing the details:

(i) The D.E. $\frac{dy}{dx} = \frac{y^2-x^2}{x^2+y^2}$ is

exact homogeneous separable (2Pt.)

(ii) The D.E. $(yx^2 - x)dx = dy$ is

Ricatti linear Bernoulli (2Pt.)

(iii) The D.E. $2xy dx + (x^2 - y)dy$ is

exact homogeneous separable (2Pt.)

(iv) The D.E. $y' = y^2 - 1$ has the solution $y = 1$ as

a singular solution a particular solution (5Pt.)

(v) According to the **Existence and Uniqueness Theorem** the IVP: $y' = xy^{\frac{1}{2}}$; $y(0)=1$ has

one solution an infinitely many solutions no solution (5 Pt.)

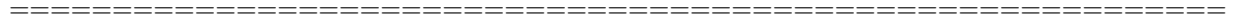
(Q_2) A large tank is filled to capacity with 200 gallons of pure water. Brine containing 2 pounds of salt per gallon is pumped into the tank at a rate 4 gallons per minute. The well mixed solution is pumped out at the same rate. Find the number $A(t)$ of pounds of salt in the tank at any time t . What is the concentration $c(t)$ of the salt in the tank at any time t . (8Pt.)

(Q₃) Two chemicals A and B are combined to form a chemical C. The rate, or velocity, of the reaction is proportional to the product of the instantaneous amounts of A and B not converted to chemical C. Initially, there are 40 grams of A and 50 grams of B, and for each grams of B, 2 grams of A is used. It is observed that 10 grams of C is formed in 5 minutes. How much is formed in 20 minutes? what is the limiting amount of C after a long time?.
(8Pt.)

Answer only three of the following four questions:

(Q₄)Solve: $t \frac{dy}{dt} + y = \frac{1}{y^2}; y(0) = 0$

(6Pt.)

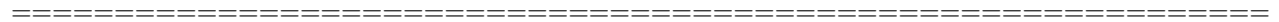


(Q₅)Solve: $(e^x + e^{-x}) \frac{dy}{dx} = y^2$

(6Pt.)

(Q₆) Solve

$$\frac{dy}{dx} + y = f(x), \quad y(0) = 0, \quad f(x) = \begin{cases} x & \text{if } 0 \leq x \leq 1, \\ 0 & \text{if } x > 1. \end{cases} \quad (6Pt.)$$



(Q₇) Solve $\frac{dy}{dx} = 2 + \sqrt{y - 2x + 3}$, (6Pt.)

Q1	Q2	Q3	Q4	Q5	Q6	Sum	Balanced points