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Final Exam, MTH 205, Summer 2010

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QUESTION 1. Find the solution to $\frac{dy}{dx} = \frac{1}{x+4y^3e^y}$, and $y(10) = 0$, (i.e. when x = 10, then y = 0.)

QUESTION 2. Solve the D.E : $\frac{dy}{dx} = (x+y)^2 sin^2(\frac{x+y-1}{x+y}) - 1$

QUESTION 3. Given $y' = -y^4 + 9y^2$. Find the critical points of the D.E, and label each as STABLE, SEMI-STABLE, NON-STABLE. If the graph of a solution to the D.E is passing through the point (4, 0), then sketch a rough graph of this solution. If the graph of a solution to the D.E. is passing through the point (4, -2), then sketch a rough graph of this solution.

QUESTION 4. Given $y = xe^x$ is a solution to the D.E : $ay^{(2)} + by' + y = e^x$, where a, b are some constants. Find the general solution to the D.E: $ay^{(2)} + by\prime + y = 0$.

QUESTION 5. Find the general solution to $2xy^{(2)} - 10y' + \frac{18}{x}y = 0$. If $y(1) = 10$, and $y'(1) = 31$, what is THE SOLUTION of the D.E.

QUESTION 6. solve the D.E: $\frac{dy}{dx} = \frac{-2xy - sin(2x+2y) + 3}{x^2 + sin(2x+2y) + ln(y)}$

QUESTION 7. solve for $f(x)$ such that $e^x f(x) = x^3 + e^{2x} - \int_0^x e^x f(r)\, dr$.

QUESTION 8. Solve for $y(x)$ such that $\int_0^x xe^{(x-2)} y'(t)\, dt = x^2 U(x-1)$, and $y(2) = 12$ [Hint: Trivial if you think!!]

QUESTION 9. Find the general solution to $sin(x)y^{(2)} - cos(x)y' = 1$

QUESTION 10. Solve for $x(t)$ and $y(t) : x'(t) - y(t) = 0$, $x(t) + \int_0^t y(r)\, dr = 2t$, $x(1) = 1$.

QUESTION 11. A thermometer is taken from inside room to the outside, where the air has a constant temperature of 5F. After one minute the thermometer reads 55F, and after 5 minutes it reads 30F. What is the initial temperature of the inside room? How long does it take before the thermometer reads 20F?

QUESTION 12. Let $A(t)$ be the population of a small town at time t where t is time in years. Given that the population of the town now is 1000, and the rate of growth is proportional to $(\frac{1}{A(t)} + A(t))$. If the population of the town after 1 year is 1200, what will be the population of the town after 3 years?

Faculty information

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