Test Total

Name _____

Exam 1 **Ordinary Differential Equations** **Dr. Kreider**

26 September 2014 **For full credit, show your work and use correct notation**

1. Solve this differential equation: $y\dfrac{dy}{dx} = xy^2 + x$ with initial condition $y(0) = 1$. Solve this explicitly for $y(x)$ instead of leaving it in implicit form.

12 pts

2. Solve this initial value problem: $(xy + 2x^2)dx + x^2dy = 0$ with $y(1) = 3$. Solve this explictly for $y(x)$ instead of leaving it in implicit form.

13 pts

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3. Solve this initial value problem: $x^2y' - 4xy = x^6e^x$ with $y(2) = 0$.

13 pts

4. At the Zippy Pizza Plaza, pizzas are prepared in a cool room with ingredients at 60^o and placed in a 1000^o oven to bake. After 5 minutes, the pizza's temperature is 95^o. How many minutes will it take the pizza to reach the serving temperature of 160^o? Newton's Law of Cooling is $T(t) = T_m + (T_0 - T_m)e^{-kt}$.

12 pts

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5. Solve the exact problem $(ye^{xy} - y\sin x + 3x^2)dx + (xe^{xy} + \cos x - 16y^{15})dy = 0$. You do not need to verify that it is exact.

12 pts

6. On the planet Mongo, the gravitational constant is $g = 100$ m/s^2 and the atmosphere imparts an air resistance that is proportional to velocity with proportionality constant 5 kg/s. Suppose a block with mass 1 kg is thrown from a 20 m tall platform with initial velocity $v_0 = 3$ m/s. Set up and solve the ODE for the velocity of the block.

13 pts

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7. A 100 cubic meter tank is filled with a salt solution with concentration 73 kg/m^3. An inflow pipe carries a salt solution with concentration 1 kg/m^3 into the tank at the rate of 6 m^3/min. An outflow pipe carries the well-mixed solution out of the tank at the same rate. Set up and solve the initial value problem to find the salt concentration $S(t)$ in the tank.

12 pts

8. Solve the initial value problem $y' - y = e^{2x}y^{-3}$ with $y(0) = 1$.

13 pts

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