Homework #2 **Math 527, UNH spring 2014**
Due Thursday, February 6th in recitation

Instructions: same as HW 1.

1. Solve the following problems, simplifying the solution as much as you can.
2. AWE: Always Write Equations!
3. ADTSTTBSOTE: Always Do The Same Thing To Both Sides Of The Equation!
4. Your work should be organized and legible.
5. Use loose-leaf paper, not pages torn out from a spiral notebook.
6. Staple the pages together in the upper left-hand corner.
7. Write your name, "Math 527, section #" (with your correct section number), and "HW 2" in the upper-right corner of the first page.

Note: Work that is not written as equations will not be graded. Homeworks that are an effort to read will be returned ungraded. Five points will be deducted if your name is illegible. Two points each will be deducted for missing or incorrect section number, homework number, or staple.

Problems 1-5: Determine whether or not the given ODE is an "exact equation". If it is, find the solution. Solve for $y(x)$ to get an explicit solution if you can. Otherwise leave your answer as implicit solution.

1. $2x \sin y + y^3 e^x + (x^2 \cos y + 3y^2 e^x)\dfrac{dy}{dx} = 0$

2. $1 + (1 + xy)e^{xy} + (1 + x^2 e^{xy})\dfrac{dy}{dx} = 0$

3. $y \sec^2 t + \sec t \tan t + (2y + \tan t)\dfrac{dy}{dt} = 0$

4. $y - ye^x + (y - e^x)\dfrac{dy}{dx} = 0$

5. $x - y^3 + y^2 \sin x - (3xy^2 + 2y \cos x)\dfrac{dy}{dx} = 0$

Problems 6,7: Solve the initial value problem.

6. $ty^3 + 3t^2y^2\dfrac{dy}{dt} = 0, \quad y(1) = 1$

7. $2x\cos y + 3x^2y + (x^3 - x^2\sin y - y)\dfrac{dy}{dx} = 0, \quad y(0) = 2$

Problems 8-10: Use the given substitution to reduce the ODE to a separable or 1st-order linear ODE. **Do not solve the resulting ODE** unless you really, really want to.

Reduce this homogeneous* ODE to a separable ODE using the substitution $u = y/x$.

8. $\dfrac{dy}{dx} = \dfrac{y^2 + 2xy}{y^2}$

Reduce this Bernoulli ODE to 1st-order linear using a substitution of the form $u = y^{1-n}$.

9. $\dfrac{dy}{dx} = y(xy^3 - 1)$

Reduce this ODE to a separable ODE using a substitution of the form $u = Ax + By + C$.

10. $\dfrac{dy}{dx} = 1 + e^{y-x+5}$