Math 370 **Workshop 01**

February 12, 2014 Due: February 14 Name: ____________________

Linear differential equations

In this workshop, you will see how to solve (remember the technical meaning of this word) linear first-order differential equations, that is, equations of the form

$$\frac{dy}{dt} + p(t)y = g(t).$$

1. Consider the equation $dy/dt + y/2 = (1/2)e^{t/3}$.

   (a) Multiply this equation by a new function $\mu(t)$.

   (a) ____________________

   (b) According to the product rule, what is $(\mu(t)y)'$?

   (b) ____________________

   (c) Make the left-hand sides of the two previous parts equal, and solve for $\mu(t)$. (You'll need to integrate.)

   (c) ____________________

   (d) Use the fundamental theorem of calculus to integrate each side of

   $$\big(\mu(t)y\big)' = (1/2)\mu(t)e^{t/3}.$$

   Choose a convenient *nonzero* value for the arbitrary constant.

   (d) ____________________

   (e) Solve for y. (Your solution should have a constant of integration in it.)

   (e) ____________________

2. Consider the equation $y' - 2y = e^{2t}$.

   (a) Multiply this equation by a new function $\mu(t)$.

   (a) ____________________________

   (b) According to the product rule, what is $(\mu(t)y)'$?

   (b) ____________________________

   (c) Make the previous part equal to the left-hand side of the first part, and solve for $\mu(t)$.

   (c) ____________________________

   (d) Use the fundamental theorem of calculus to integrate the equation $(\mu(t)y)' = \mu(t)e^{2t}$.

   (d) ____________________________

   (e) Solve for y. (Your solution should have a constant of integration in it.)

   (e) ____________________________