Due Thursday, Feb. 16 at the beginning of class.

1. Show that the equation is exact and then solve it.
   (a) $(1 + e^x y + xe^x y)dx + (xe^x + 2)dy = 0$
   (b) $\dfrac{dy}{dx} = -\dfrac{2xy^2 + 1}{2x^2 y}$
   (c) $(2xy - \sec^2 x)dx + (x^2 + 2y)dy = 0$

2. Find an integrating factor and then solve the equation.
   (a) $(3x^2 + y)dx + (x^2 y - x)dy = 0$
   (b) $(2y^2 + 2y + 4x^2)dx + (2xy + x)dy = 0$

3. Find an integrating factor of the form $x^n y^m$ and then solve the equation

$$(2y^2 - 6xy)dx + (3xy - 4x^2)dy = 0$$

4. Determine the longest interval in which the given initial value problem is certain to have a unique solution. Do not solve the problem.
   (a) $(1 + t^2)y'' + ty' - y = \tan t$, $y(1) = y_0$, $y'(1) = y_1$.
   (b) $t(t - 3)y'' + 2ty' - y = t^2$, $y(1) = y_0$, $y'(1) = y_1$.
   (c) $e^t y'' + \dfrac{y'}{t - 3} + y = \ln t$, $y(1) = y_0$, $y'(1) = y_1$.

5. Find the Wronskian for the given pair of functions.
   (a) $y_1(t) = e^{3t}$, $y_2(t) = e^{-4t}$.
   (b) $y_1(t) = e^{-t}\cos(2t)$, $y_2(t) = e^{-t}\sin(2t)$.

6. If the Wronskian of f and g is $3e^{4t}$, and if $f(t) = e^{2t}$, find $g(t)$.