Due Thursday, Feb. 18 at the beginning of class.

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

2. Find an integrating factor of the form $x^n y^m$ and then solve the equation
$$(2y^2 - 6xy)dx + (3xy - 4x^2)dy = 0$$

3. Find a general solution to the given differential equation.
   (a) $y'' + 8y' + 16y = 0$
   (b) $y'' - y' - 2y = 0$
   (c) $y'' - 5y' + 6y = 0$
   (d) $4y'' - 4y' + y = 0$

4. Solve the given initial value problem.
   (a) $y'' + 2y' - 8y = 0$, $y(0) = 3$, $y'(0) = -12$
   (b) $y'' + 2y' + y = 0$, $y(0) = 2$, $y'(0) = 1$

5. 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) $e^t y'' + \dfrac{y'}{t-3} + y = \ln t$, $y(1) = y_0$, $y'(1) = y_1$.

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