

MATH 315 WRITTEN ASSIGNMENT 1

DUE MONDAY FEBRUARY 24

- Find all solutions of the following equations.
 - $y''' = x^2 + 2$.
 - $y^{(n)} = 0$, where $n > 0$ is an integer, and $y^{(n)}$ denotes the n -th derivative of $y = y(x)$.
- Find and classify all equilibrium points of $y' = y \sin y$.
- Find the solution of $y' = 2\sqrt{y}$ passing through the point (x_0, y_0) , where $y_0 > 0$.
- Solve the following equations.
 - $xy' + y = 3x^3 - 1$ (for $x > 0$).
 - $y' - y \tan x = e^{\sin x}$.
 - $y' + e^x y = 3e^x$.
- Find all solutions of the equation $y' + 2y = q(x)$, where q is the function given by
$$q(x) = \begin{cases} 1 - |x|, & \text{for } |x| \leq 1, \\ 0, & \text{for } |x| \geq 1. \end{cases}$$
- Determine which equations are exact on the whole plane, and solve them.
 - $2xy \, dx + (x^2 + 3y^2) \, dy = 0$.
 - $(x^2 + xy) \, dx + xy \, dy = 0$.
 - $\cos x \cos^2 y \, dx - \sin x \sin 2y \, dy = 0$.
 - $(2ye^{2x} + 2x \cos y) \, dx + (e^{2x} - x^2 \sin y) \, dy = 0$.
- Solve the following equations.
 - $y' = \frac{x^2 + xy + y^2}{x^2}$.
 - $y' = \frac{1}{2} \left(\frac{x + y - 1}{x + 2} \right)^2$. *Hint:* Try to reduce the equation into a homogeneous equation by means of the substitution $x = t + a$ and $y = u + b$, where t is the new independent variable, $u = u(t)$ is the new dependent variable, and a and b are constants that should be suitably chosen.
- Find all solutions of the following equations.
 - $y'' - 4y = 0$.
 - $3y'' + 2y' = 0$.
 - $y'' - 4y' + 5y = 0$.
- Find the solutions of the following initial value problems.
 - $y'' - 2y' - 3y = 0$, $y(0) = 0$, $y'(0) = 1$.
 - $y'' + 16y = 0$, $y(0) = \pi$, $y'(0) = \pi^2$.

Date: February 7, 2014.

HOMEWORK POLICY

You are welcome to consult each other provided (1) you list all people and sources who aided you, or whom you aided and (2) you write-up the solutions independently, in your own language. If you seek help from other people, you should be seeking general advice, not specific solutions, and must disclose this help. This applies especially to internet fora such as **MathStackExchange**.

Similarly, if you consult books and papers outside your notes, you should be looking for better understanding of or different points of view on the material, not solutions to the problems.