

Problem Set 1

[Your name] and [student ID]
MATB44H3-2019

September 11, 2019

Problem (Teschl) 1.3. Classify the following differential equations. Is the equation linear, autonomous, or homogeneous? What is its order? Note also that these classifications only apply to differential equations, so a valid answer could be that the equation is not an ODE.

(i) $y'(x) + y(x) = 0$

(ii) $\frac{d^2}{dt^2}u(t) = t \sin(u(t))$

(iii) $y(t)^2 + 2y(t) = 0$

(v) $\dot{x} = -y, \dot{y} = x$

Solution. Collaborators: [Collaborator 1], [Collaborator 2], [Collaborator 3]

Write a solution here

□

Problem (Teschl) 1.4. Which of the following differential equations for $y(x)$ are linear?

(i) $y' = \sin(x)y + \cos(y)$

(ii) $y' = \sin(y)x + \cos(x)$

(iii) $y' = \sin(x)y + \cos(x)$

Solution. No collaborators

Write a solution here

□

Problem (Teschl) 1.5. Find the most general form of a second-order linear equation

Solution. Write a solution here.

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- Teschl Problem 1.3. Parts (i), (ii), (iii), (v). Make sure to say if the equation is linear, autonomous, or homogeneous, and give its order. Note that these classifications only apply to differential equations, so a valid answer is that the equation is not an ODE.
- Teschl Problem 1.4
- Teschl Problem 1.5
- Teschl Problem 1.6. Prove your answer to the question about whether linearity is always preserved.
- Teschl Problem 1.7. Explain why linearity is or is not preserved in this particular problem.
- Teschl Problem 1.8.
- Teschl Problem 1.9. Parts (i), (ii) only.
- Teschl Problem 1.12
- Teschl Problem 1.14
- Teschl Problem 1.15
- Teschl Problem 1.18. Parts (i), (ii) only.
- Teschl Problem 1.22
- Teschl Problem 1.23

Optional bonus problems:

- Teschl Problem 1.10 (bonus)
- Teschl Problem 1.13 (bonus)
- Teschl Problem 1.24 (bonus)