

AMCS 390 Fall 2017 Homework 3

Come prepared to present your solutions on Monday, September 18th.

Determine the dispersion relation for the following systems of PDEs. Describe whether the resulting dynamics will be dispersive, dissipative, etc.

1.

$$\begin{aligned}v_t &= u_{xx} \\ u_t &= v.\end{aligned}$$

2.

$$\begin{aligned}v_t &= u_x \\ u_t &= v_x.\end{aligned}$$

3.

$$iu_t = u_{xx} - V(x)\psi.$$

This is the Schrodinger equation and $V(x)$ is the potential; for this exercise you can take V to be a constant function.

4. (bonus; this one is a bit more difficult)

$$\begin{aligned}u_t &= v_x + v_{xx} \\ v_t &= u_x - u_{xx}.\end{aligned}$$