

1. Consider the equation $2u_x + 3u_t = 0$.
 - (a) Find a particular solution of the form $u(x, t) = e^{rx+st}$.
 - (b) Discuss the geometric method to find the general solution. What are the characteristic curves? Draw a picture.
 - (c) Discuss the coordinate method to find the general solution. Draw a picture.
 - (d) Find a solution considering the auxiliary condition $u(0, t) = t^2$.
2. Find the general solution of the following PDEs. Which of them are linear, homogeneous? What are their orders?
 - (a) $u_x = t \sin x$;
 - (b) $u_{xx} = 1$;
 - (c) $u_{xxt} = 1$;
 - (d) $u_{xx} = u$;
 - (e) $uu_{xt} - u_x u_t = 0$.
3. Consider the equation $u_{xx} + u_{tt} = 0$.
 - (a) Find a particular solution of the form $u(x, t) = e^{rx+st}$.
 - (b) Do Separation of Variables.
4. Separate the variables in
 - (a) $x^2 u_{xx} + x u_x - u_t = 0$;
 - (b) $u_x - u_y + 2u_z = 0$.
5. Consider $au_x + bu_y + cu_z + du = 0$.
 - (a) Find the general solution using the geometric method.
 - (b) Find the general solution using the coordinate method.
 - (c) Find a solution with $a = 2$, $b = 3$, $c = 1$, and $u(x, 0, z) = \sin z$.