

13. Transform the following PDEs into standard form. For each step, write down exactly the transformation that is needed. Also, determine whether the equation is hyperbolic, elliptic, or parabolic:
- (a) $3u_{xx} + 4u_{tt} - u = 0$;
 - (b) $4u_{xx} + u_{xt} + 4u_{tt} + u = 0$;
 - (c) $u_{xx} + u_{tt} + 3u_x - 4u_t + 25u = 0$;
 - (d) $u_{xx} + 2u_{xt} + u_{tt} + u_x - 2u_t + u = 0$.
14. Find all second-order linear homogeneous PDEs in x and t that are left unchanged by any rotation of axes.
15. Determine α so that a rotation with α° transforms $u_{xt} = 0$ into $u_{xx} - u_{tt} = 0$. Find the general solutions of both PDEs.
16. Determine a transformation that transforms $u_{xx} - u_{tt} = 0$ into $u_{tt} = du_{xx}$, where $d > 0$. Then find the general solution of $u_{tt} = du_{xx}$.
17. Obtain the general solution of $3u_{xx} + 10u_{xt} + 3u_{tt} = 0$.