

2. Show that, like the wave equation, the given PDE is hyperbolic and find its general solution by introducing the suggested change of variables.

- (a)  $u_{xx} + 4u_{xy} + 3u_{yy} = 0$ ;  $\xi = x - y$ ,  $\eta = 3x - y$
- (b)  $u_{xx} - 4u_{xy} - 5u_{yy} = 0$ ;  $\xi = x - y$ ,  $\eta = 5x + y$
- (c)  $u_{xx} + 6u_{xy} + 8u_{yy} = 0$ ;  $\xi = 4x - y$ ,  $\eta = 2x - y$
- (d)  $u_{xx} + 4u_{xy} - 5u_{yy} = 0$ ;  $\xi = x + y$ ,  $\eta = 5x - y$
- (e)  $u_{xx} + 2u_{xy} - 3u_{yy} = 0$ ;  $\xi = 3x - y$ ,  $\eta = x + y$

(Please solve for only part (b).)

(The problem is from Vibrating String; d'Alembert's Solution in Wave Equation.)