

Math 4315 - PDEs Chain Rule

$$u_x = u_r r_x + u_s s_x, \quad u_y = u_r r_y + u_s s_y,$$

$$u_{xx} = u_{rr} r_x^2 + 2u_{rs} r_x s_x + u_{ss} s_x^2 + u_r r_{xx} + u_s s_{xx},$$

$$u_{xy} = u_{rr} r_x r_y + (r_x s_y + r_y s_x) u_{rs} + u_{ss} s_x s_y + u_r r_{xy} + u_s s_{xy},$$

$$u_{yy} = u_{rr} r_y^2 + 2u_{rs} r_y s_y + u_{ss} s_y^2 + u_r r_{yy} + u_s s_{yy}.$$