

L9: 14.6 pdf Quiz

10/8/20

1. Find  $df/dr$  &  $df/ds$  as fns. of  $r$  &  $s$ , if  $f(x,y) = x^2 + 2xy^2 + 2y^3$  & the vars. are related by  $x = r + 2s$  &  $y = 3r + 2s$

$$f_r = (f_x)(x_r) + (f_y)(y_r) = (2x + 2y^2)(1) + (4xy + 6y^2)(3) = 2x + 2y^2 + 12xy + 18y^2$$

$$f_s = (f_x)(x_s) + (f_y)(y_s) = (2x + 2y^2)(2) + (4xy + 6y^2)(2) = 4x + 4y^2 + 8xy + 12y^2$$

$$f_r = 2(r+2s) + 2(3r+2s)^2 + 12(r+2s)(3r+2s) + 18(3r+2s)^2$$

$$f_s = 4(r+2s) + 4(3r+2s)^2 + 8(r+2s)(3r+2s) + 12(3r+2s)^2$$

2. Find  $dz/dx$  &  $dz/dy$  if  $x^2 + y^2 + z^2 = 5xyz + 1 \Rightarrow x^2 + y^2 + z^2 - 5xyz - 1 = 0$

$$F(x,y,z) = x^2 + y^2 + z^2 - 5xyz - 1$$

$$\frac{dz}{dx} = -\frac{F_x}{F_z}$$

$$\frac{dz}{dy} = -\frac{F_y}{F_z}$$

$$F_x = 2x - 5yz$$

$$F_y = 2y - 5xz$$

$$F_z = 2z - 5xy$$

$$\frac{dz}{dx} = -\frac{2x - 5yz}{2z - 5xy}$$

$$\frac{dz}{dy} = -\frac{2y - 5xz}{2z - 5xy}$$