$$f_{xy} = -\frac{y^2}{x^3} + 4x^3e^y \qquad f_{yx} = 6\frac{x}{y^4} + x^4e^y$$

$$f_{xx} = 12x^2e^y \qquad f_{yy} = -2\frac{x}{y^3} + x^4e^y$$

$$f_x = \frac{1}{y^2} + 4x^3e^y$$

d) $f(x,y) = \frac{x}{y^2} + x^4e^y$

$$f_{xy} = 6(x+y)^2 \quad (y+1)$$

$$f_{xy} = 2(x+y)^3$$

$$f_{xx} = 6(x+y)(y+1)^2$$

$$f_y = 2(y+1)(x+y)^3$$

$$f_x = 3(x+y)^2(y+1)^2$$

$$f_x = (y+1)^2 \cdot 3(x+y)^2 \cdot 1$$

c) $f(x,y) = (x+y)^3(y+1)^2$