Q5.5

Find the gradient of the function

a)
$$f(x,y) = x^2y + yx^3 - y^2 + 2x + 4$$

$$abla \left(f
ight) = egin{bmatrix} rac{\partial}{\partial x} \left(f
ight) \ rac{\partial}{\partial y} \left(f
ight) \end{bmatrix} = egin{bmatrix} \left(3x^2y + 2xy + 2
ight) \ \left(x^3 + x^2 - 2y
ight) \end{bmatrix}$$

b)
$$f(x_1,x_2,x_3) = x_1 sin(x_2) + 2x_2 x_3^2$$

$$abla \left(f
ight) = egin{array}{c} rac{\partial}{\partial \left.x_{1}
ight.}\left(f
ight) \ rac{\partial}{\partial \left.x_{2}
ight.}\left(f
ight) \ rac{\partial}{\partial \left.x_{3}
ight.}\left(f
ight)
ight] = egin{array}{c} \sin\left(x_{2}
ight) \ \left(x_{1}\cos\left(x_{2}
ight) + 2x_{3}^{2}
ight) \ 4x_{2}x_{3} \ \end{array}
ight]$$

c)
$$f(x_1,x_2)=x_2e^{-x_1}$$

$$abla \left(f
ight) = egin{array}{c} rac{\partial}{\partial \, x_1} \left(f
ight) \ rac{\partial}{\partial \, x_2} \left(f
ight) \end{array}
ight] = egin{array}{c} \left(-e^{-x_1} x_2
ight) \ e^{-x_1} \end{array}
ight]$$