Quiz5 Solutions

CSE 4/574

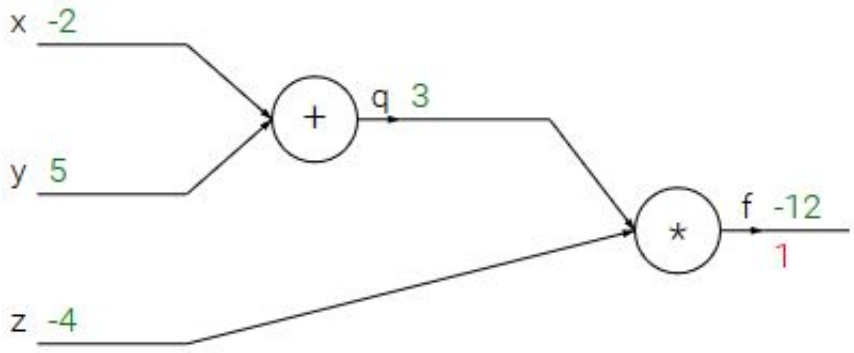
Fall, 2024

Question 1

Suppose you have inputs as x, y and z with values -2, 5, and -4 respectively. You have a neuron 'q' and neuron 'f' with functions:

$$q = x + y$$
$$f = q * z$$

Graphical representation of the functions is as follows:



What is the gradient of f with respect to x, y, and z?

Correct Choice

$(-4, -4, 3)$

Problem Explanation:

$$
\begin{aligned}
f &= (x+y) * z \\
\frac{\partial f}{\partial x} &= \frac{\partial}{\partial x}(xz+yz) = z = -4 \\
\frac{\partial f}{\partial y} &= \frac{\partial}{\partial y}(xz+yz) = z = -4 \\
\frac{\partial f}{\partial z} &= \frac{\partial}{\partial z}(x+y)z = (x+y) = 3
\end{aligned}
$$

Question 2

$Y = ax^2 + bx + c$ (polynomial equation of degree 2)

Can this equation be represented by a neural network of single hidden layer with linear threshold?

Correct Choice

No.

Problem Explanation:
In a nerual network, the calculation from the input layer up to the output before activation is a linear combination. As the equation has a degree of 2, the equation isn't linear. Furthermore, by adding the linear threshold, the equation remains linear. Therefore, it's still not represented because of the non-linearity of the equation.