ReLU and Leaky ReLU Activation Functions

ReLU Activation Function

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$$\text{ReLU}(x) = \begin{cases} 0 & \text{for} \quad x < 0 \\ x & \text{for} \quad x \geq 0 \end{cases}$$

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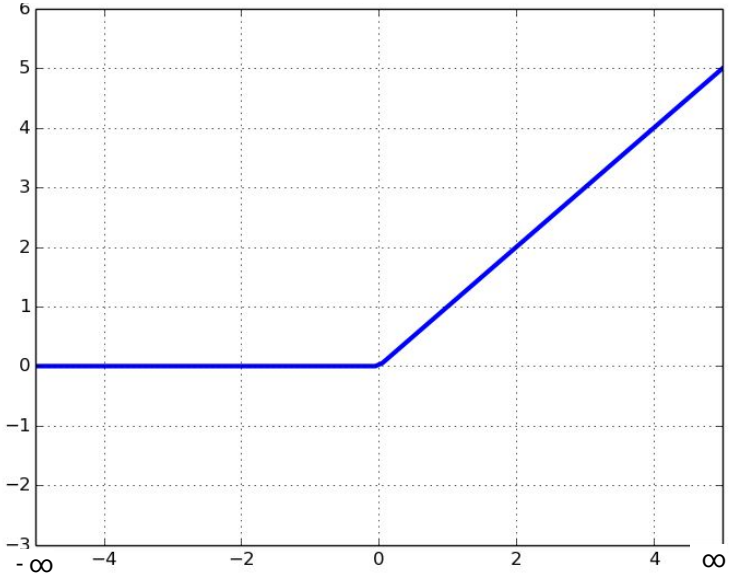

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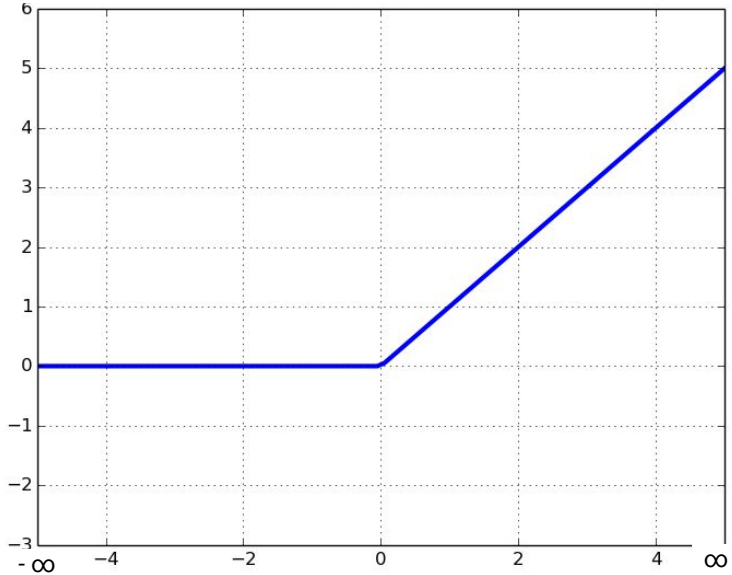
ReLU(x) = max (0, x)



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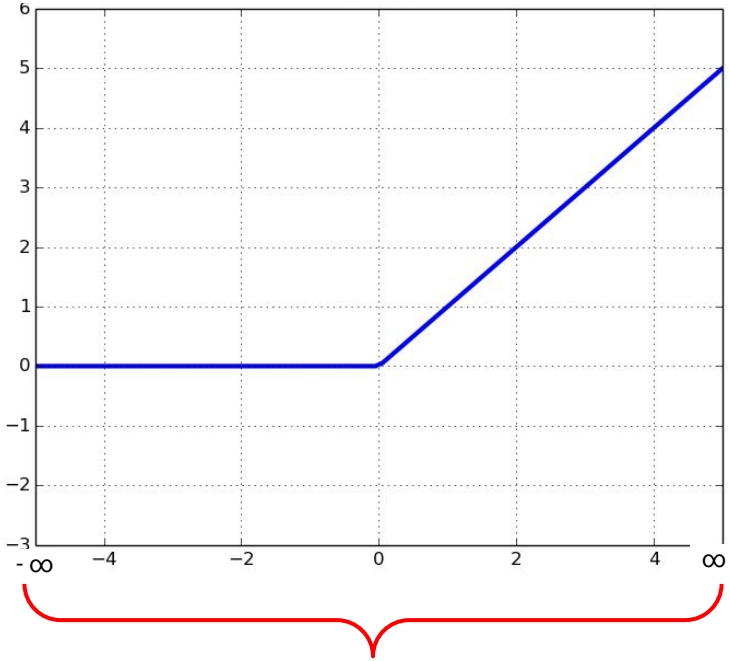

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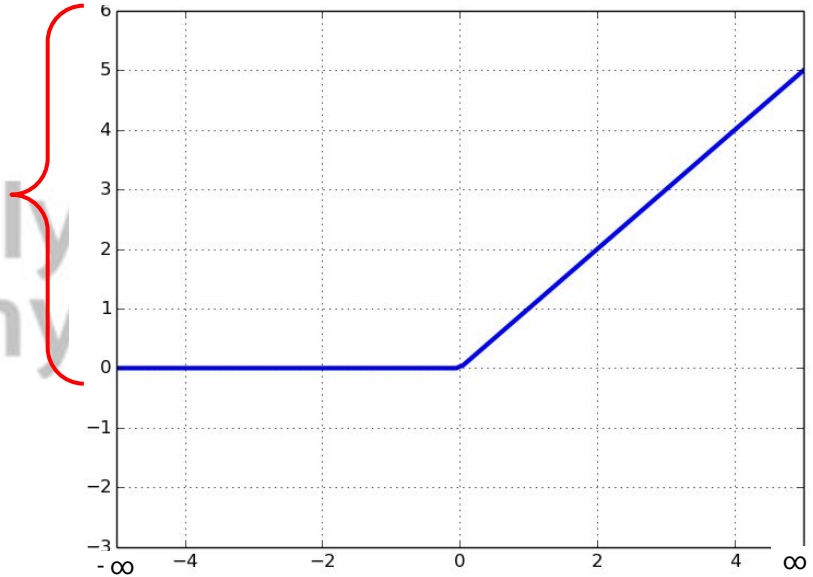

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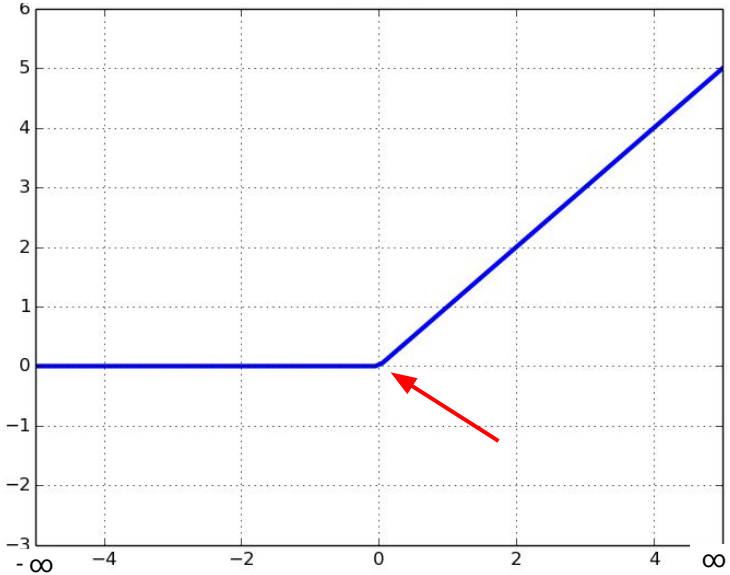

ReLU Activation Function Derivative

- ReLU Activation Function:

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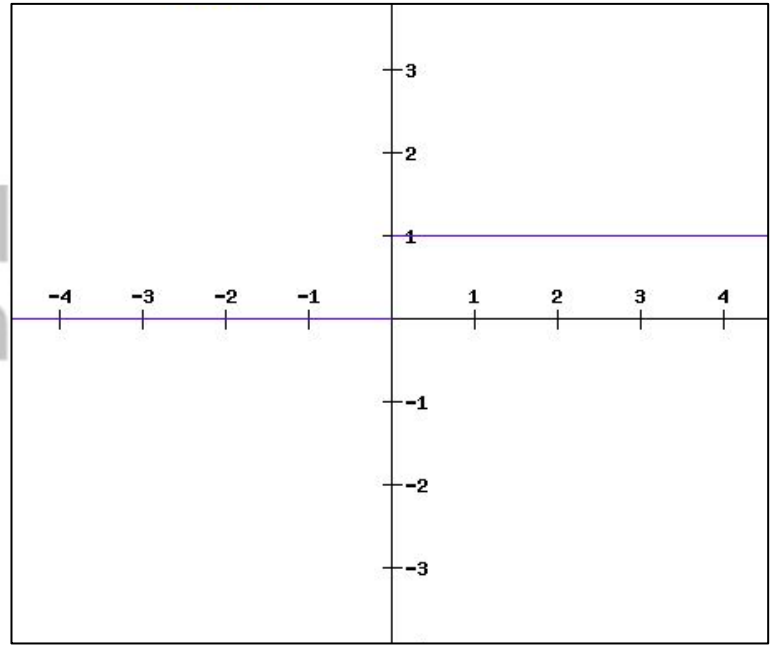

- ReLU Function derivative:

$$\frac{d\,\text{ReLU}}{d\,x} = \begin{cases} 0 & \text{for } x<0 \\ 1 & \text{for } x>0 \\ \text{Not defined} & \text{at } x=0 \end{cases}$$

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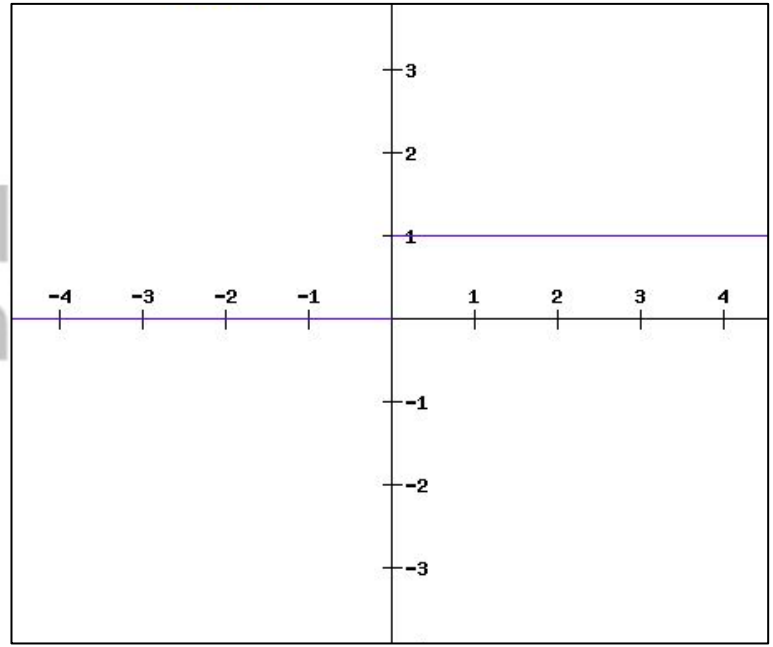

- ReLU Function derivative:

$$\frac{d\,\text{ReLU}}{d\,x} = \begin{cases} 0 & \text{for} \quad x \leq 0 \\ 1 & \text{for} \quad x > 0 \end{cases}$$

Back Propagation in Neural Network

$$w = w - \alpha * dE / dw$$

$$b = b - \alpha * dE / db$$

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$$\frac{dE}{db_{ih}} = \frac{dE}{dO} * \frac{dO}{dZ_2} * \frac{dZ_2}{dh_1} * \frac{dh_1}{dZ_1} * \frac{dZ_1}{db_{ih}}$$

Leaky ReLU Activation Function

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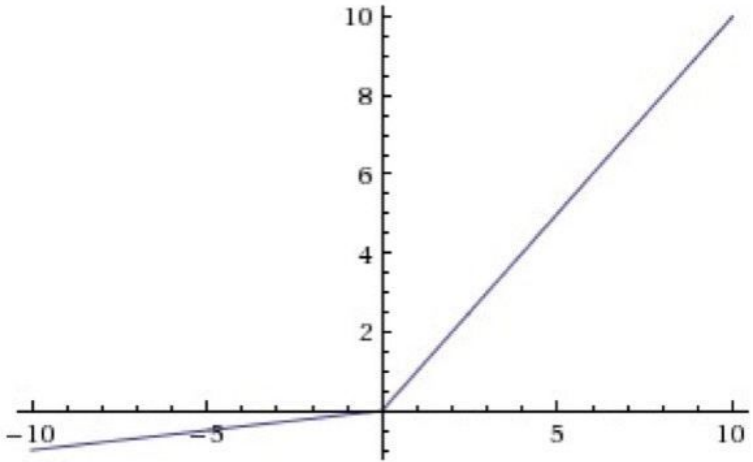
- Leaky ReLU Activation Function:

$$\text{Leaky ReLU(x)} = \begin{cases} 0.01x & \text{for} \quad x < 0 \\ x & \text{for} \quad x \geq 0 \end{cases}$$



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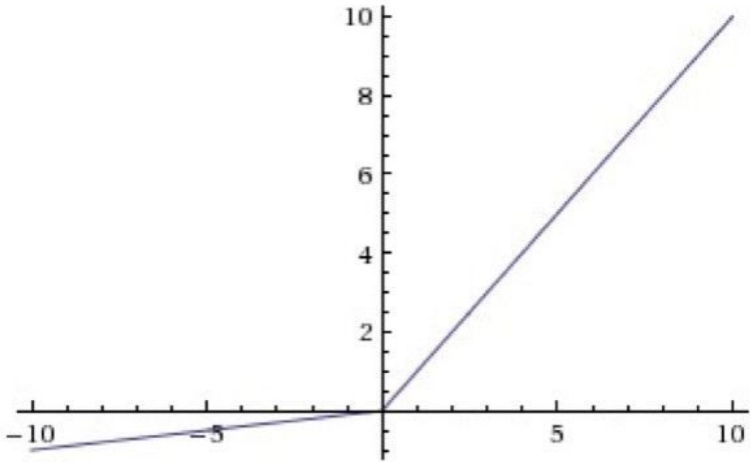

Leaky ReLU(x) = max (0.01 x, x)

Leaky ReLU Derivative

- Leaky ReLU Activation Function:

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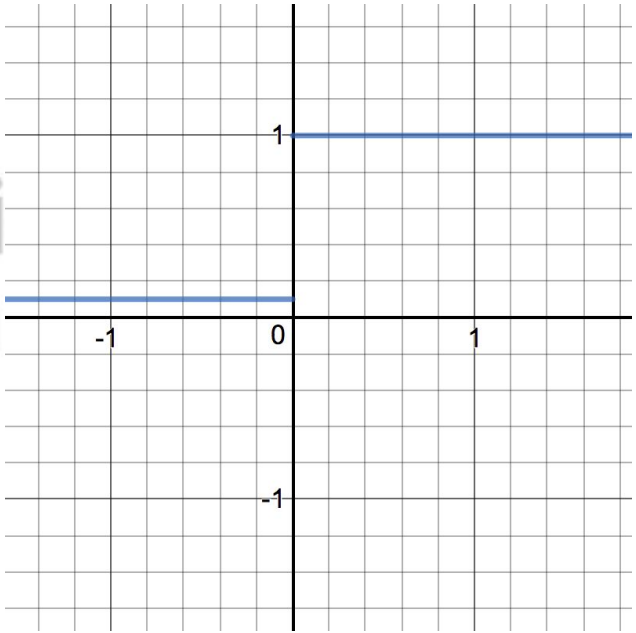

- Leaky ReLU derivative:

$$\frac{d\ \text{LeakyReLU}}{d\ x} = \begin{cases} 0.01 & \text{for} \quad x \leq 0 \\ 1 & \text{for} \quad x > 0 \end{cases}$$

Thank You