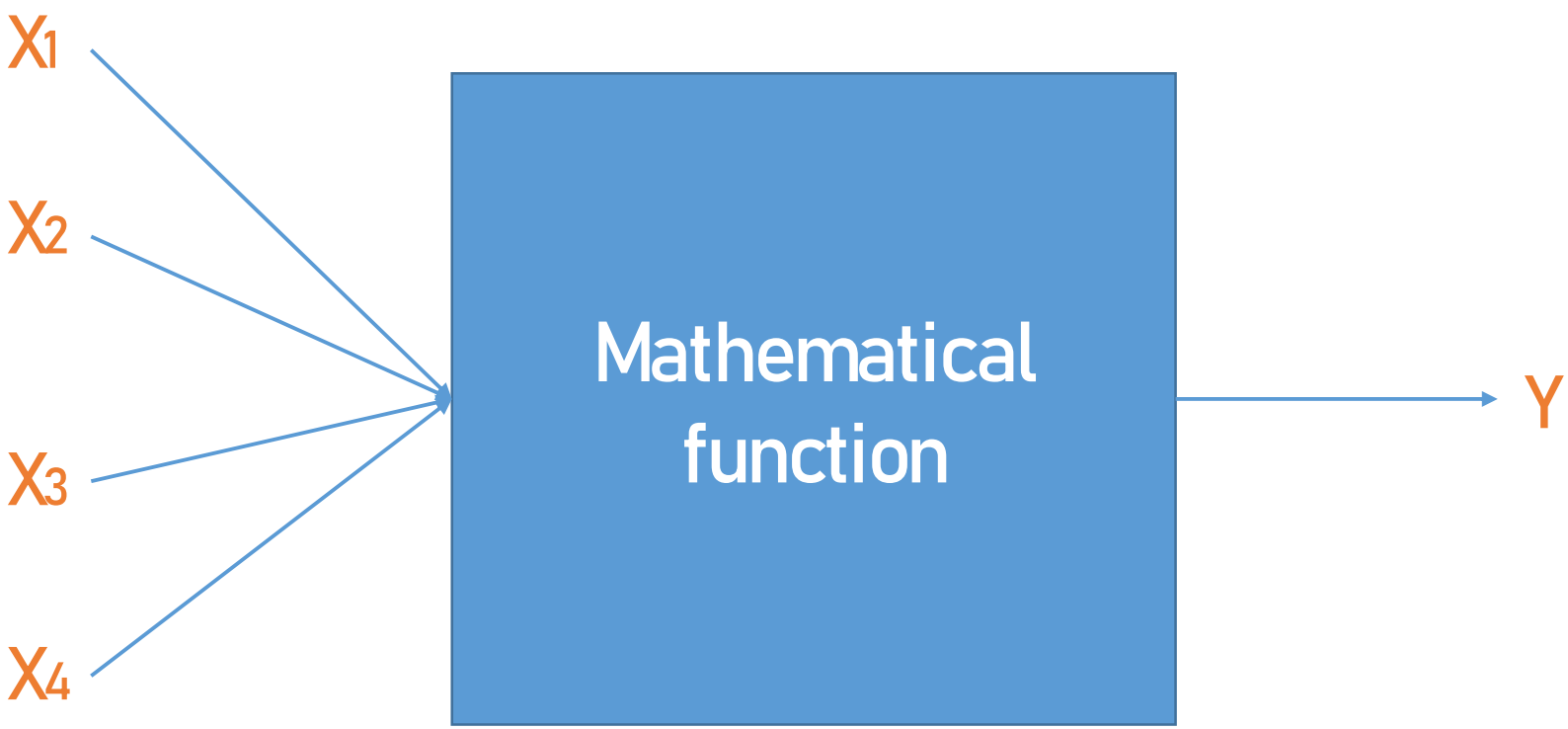
# Neuron as a mathematical function

# Zoom into a neuron

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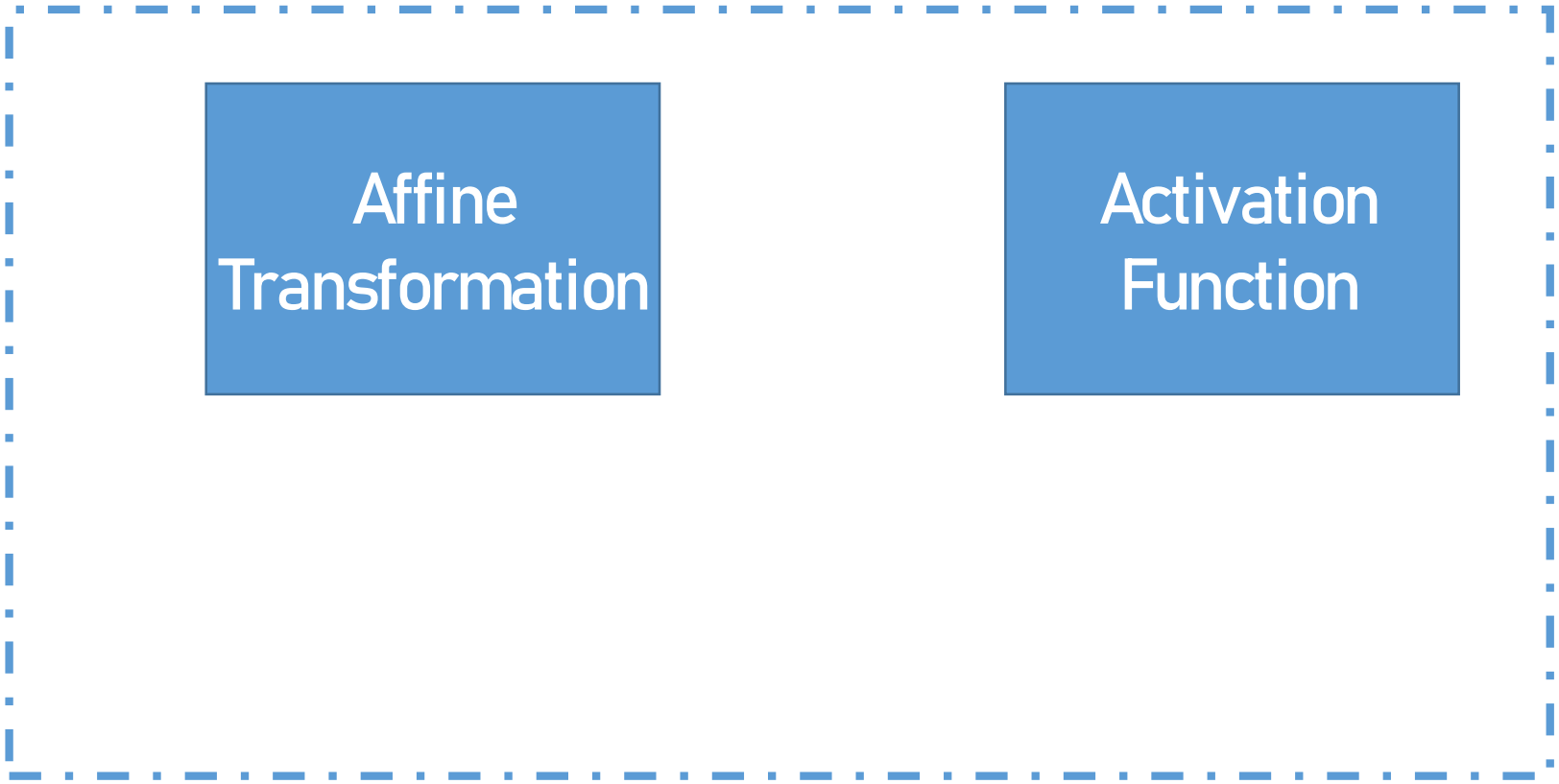


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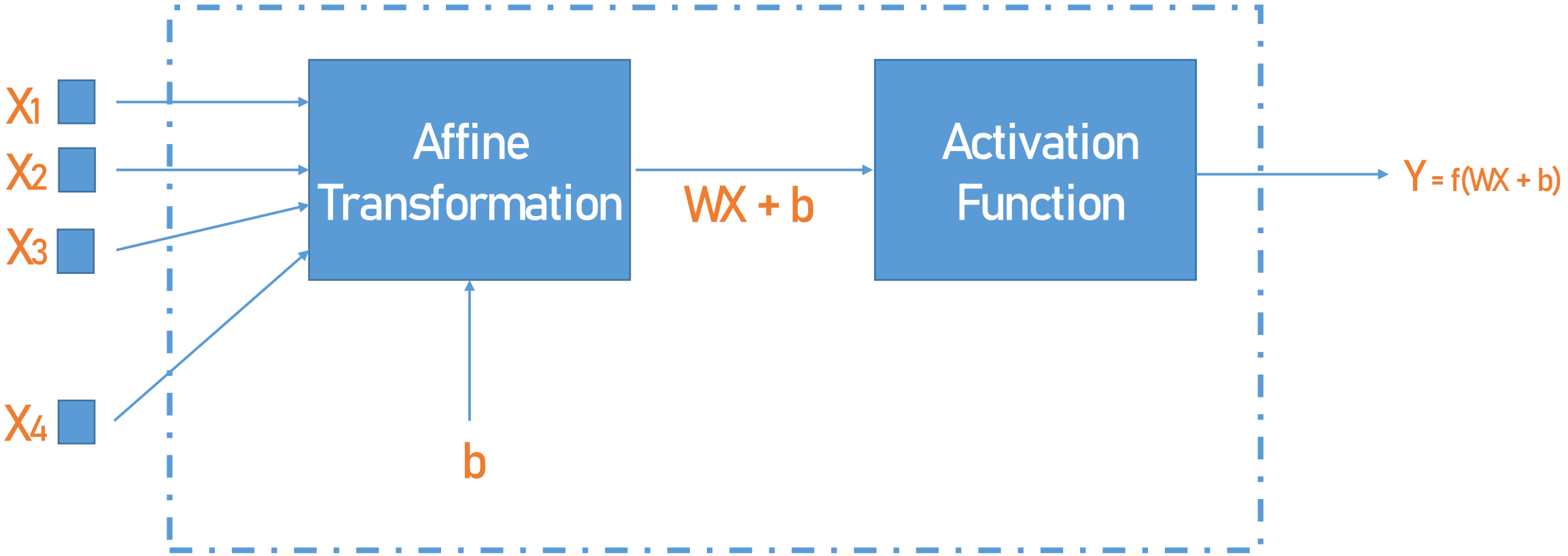


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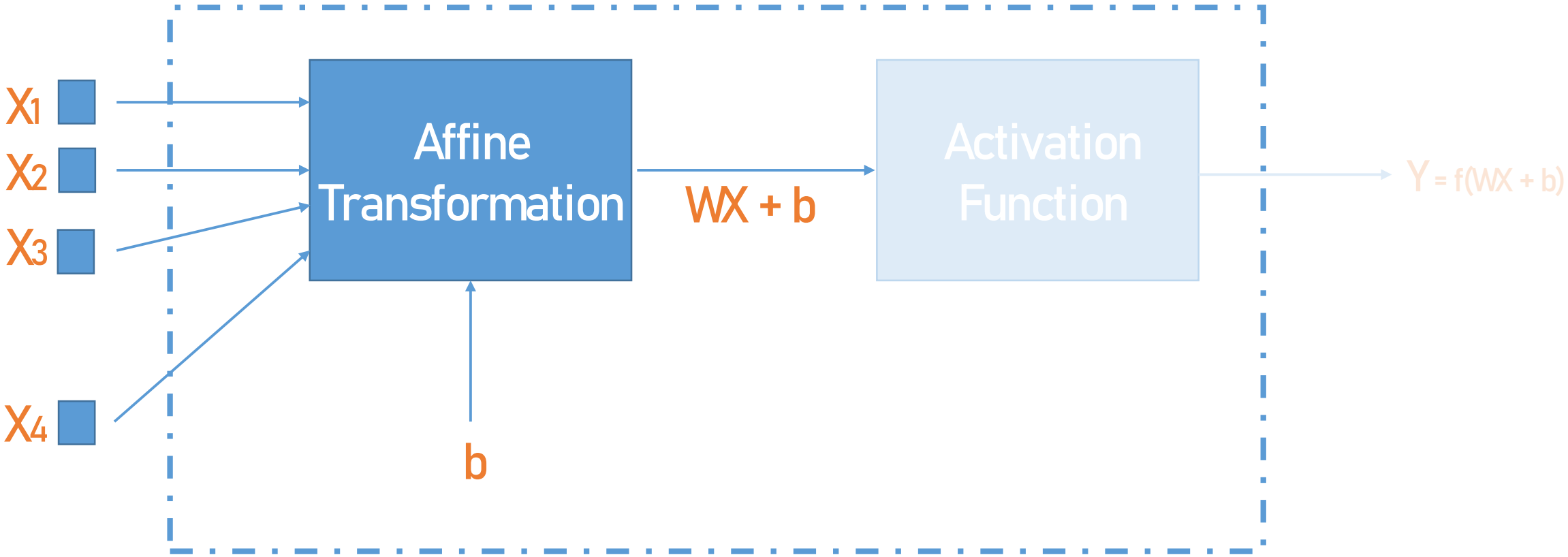


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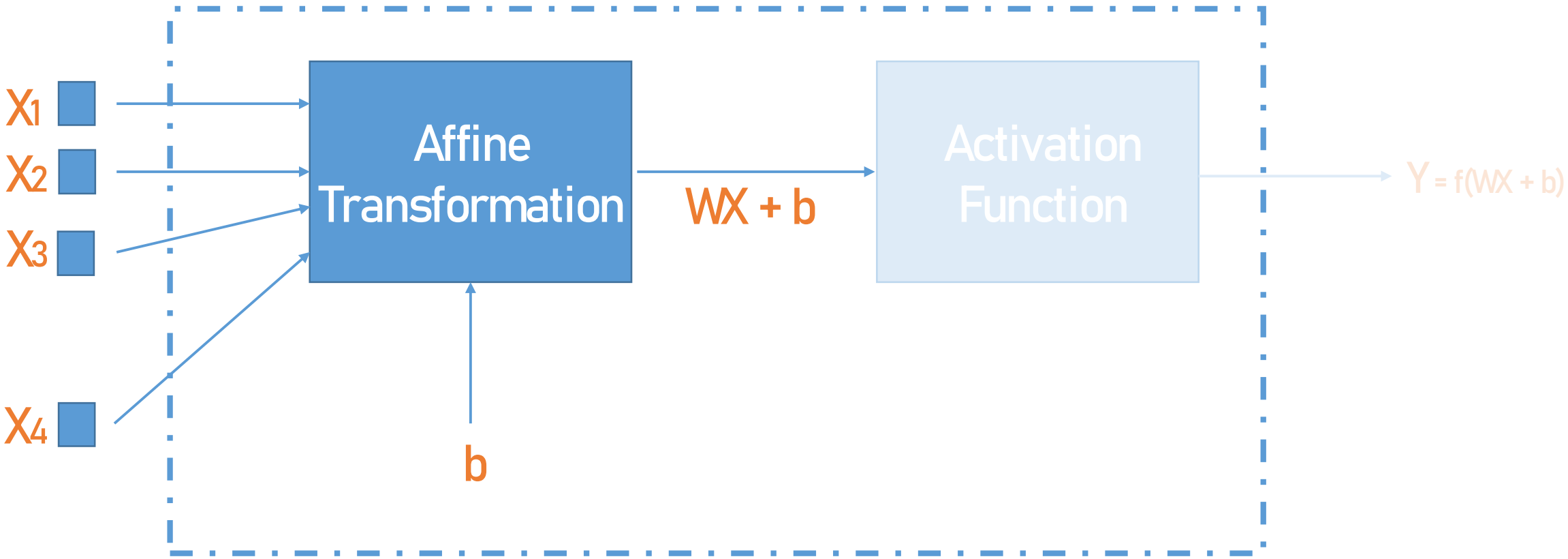
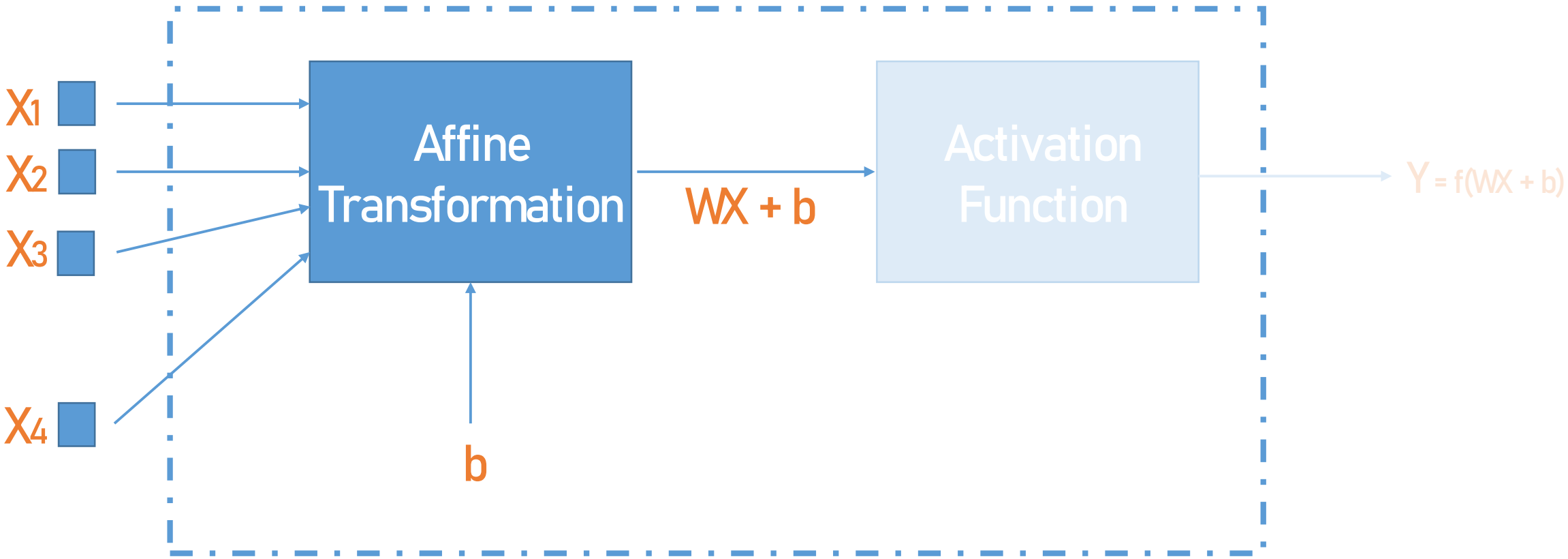


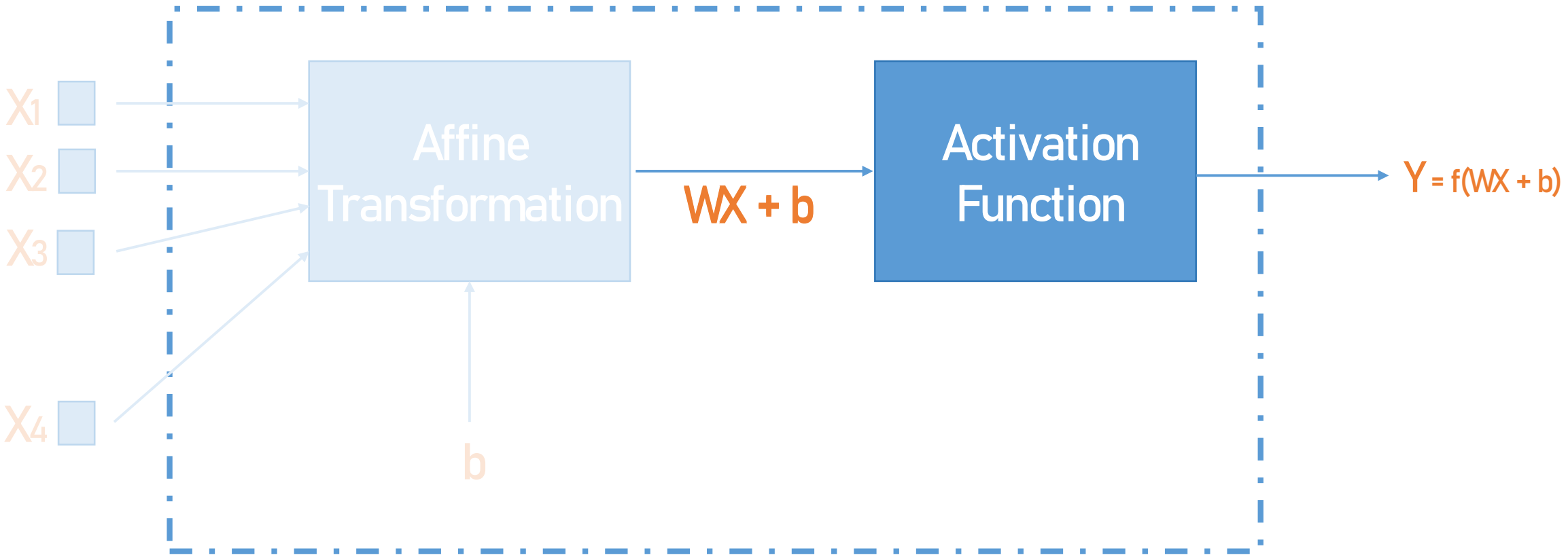

Affine transformation can learn only linear relationships between inputs & output

# Zoom into a neuron



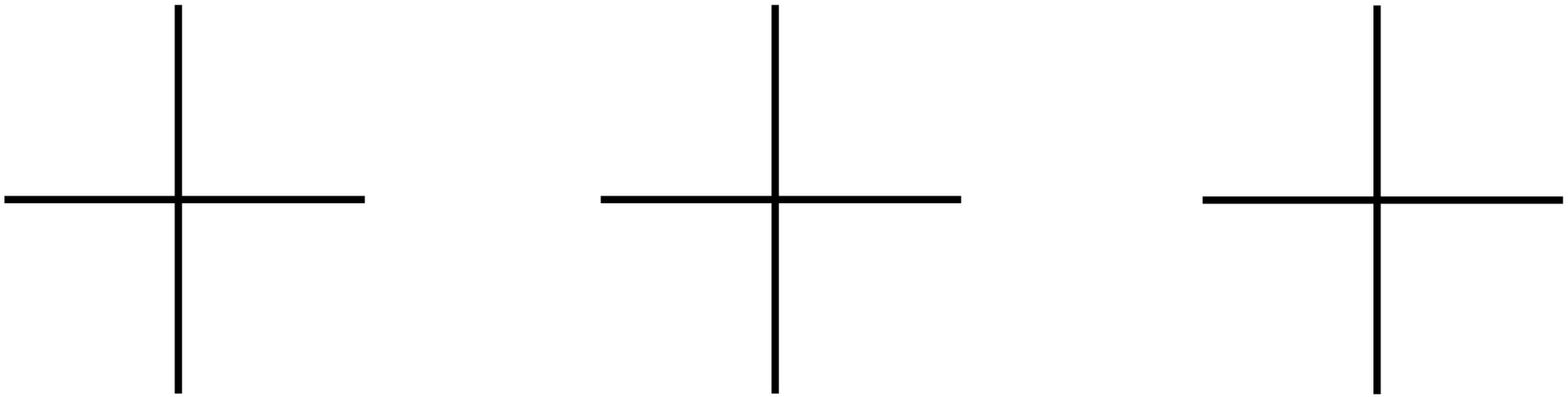

$WX + b$ is the weighted sum of the inputs & associated weights with a bias: $W_1X_1 + W_2X_2 + W_3X_3 + \ldots + W_NX_N + b$

# Zoom into a neuron




Activation functions helps in finding non-linear relationships between inputs & output

# Common Activation Functions



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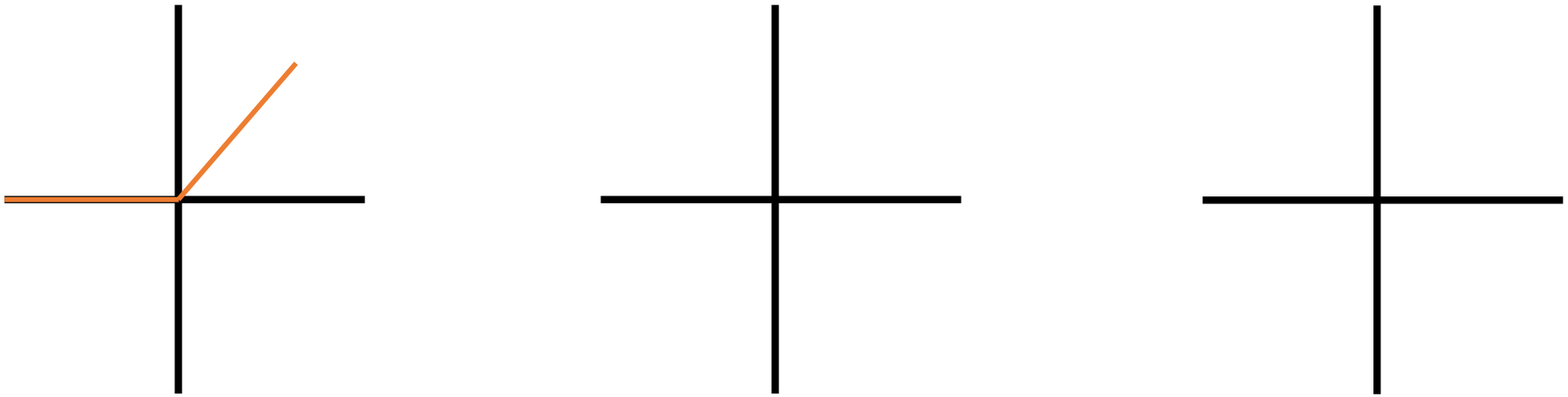

ReLU

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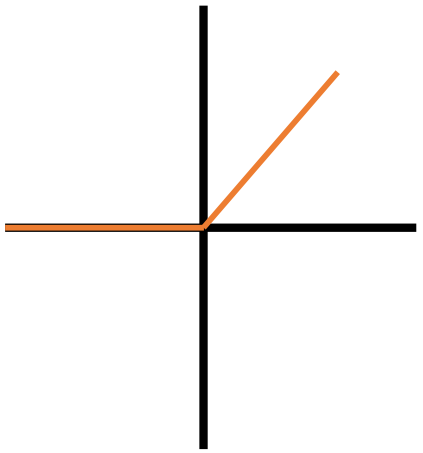
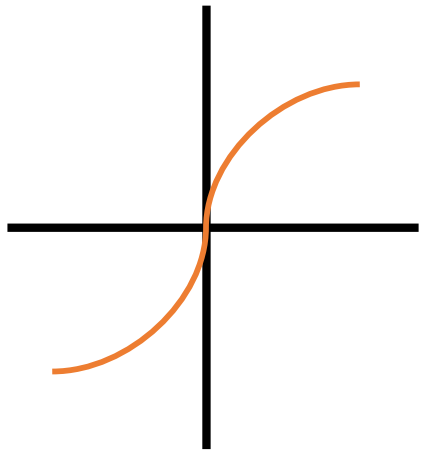
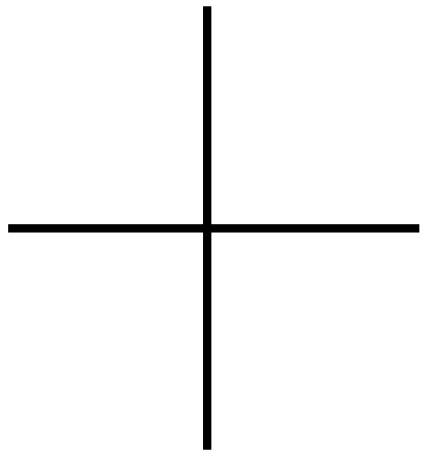


ReLU



tanh



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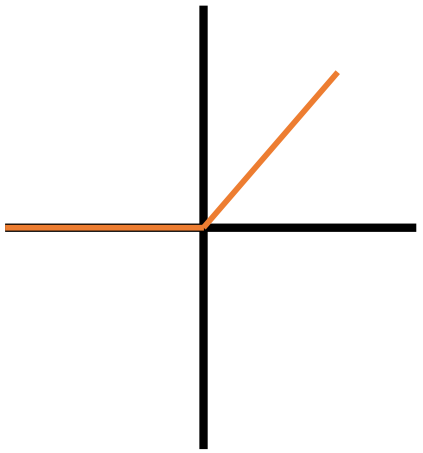

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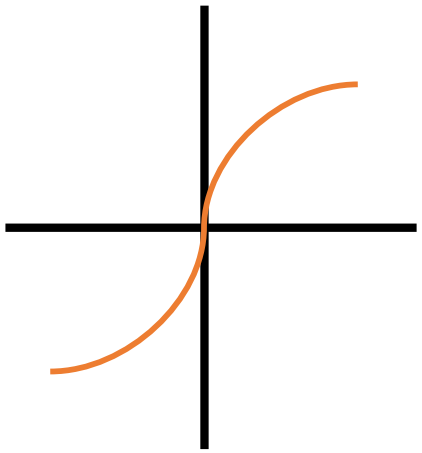

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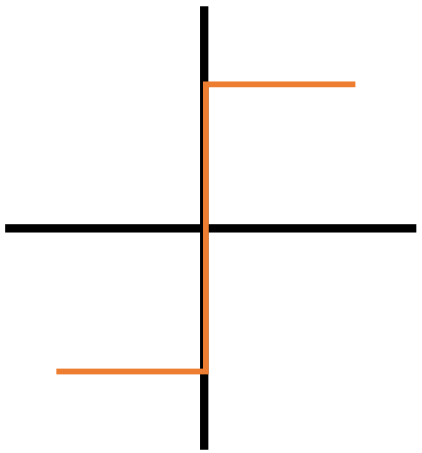
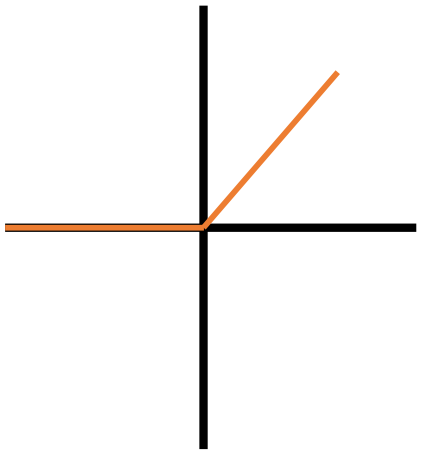


step

# ReLU Activation



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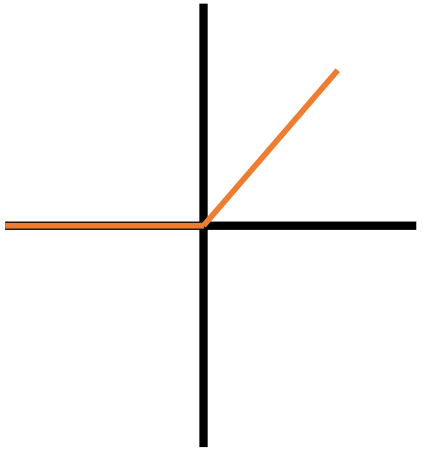


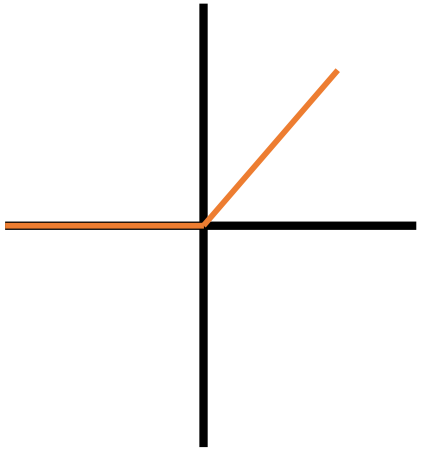
**Most common activation function**

ReLU: Rectified Linear Unit

ReLU(X) = max(X, 0)

Clipping function

# ReLU Activation



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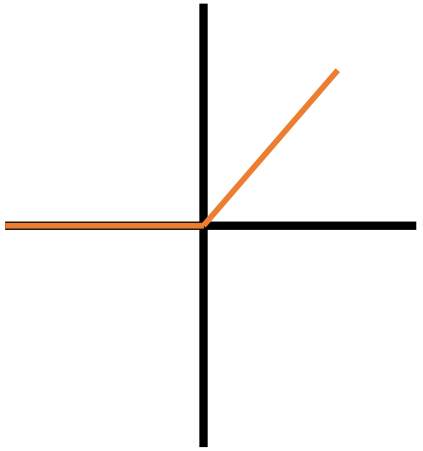

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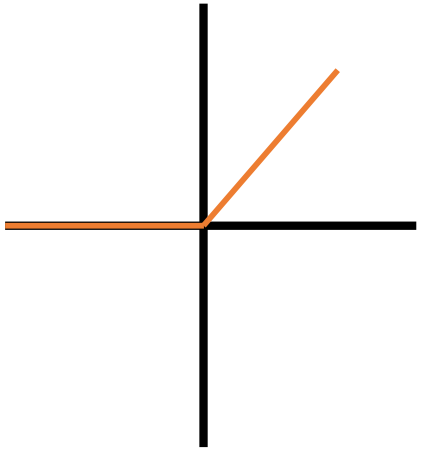

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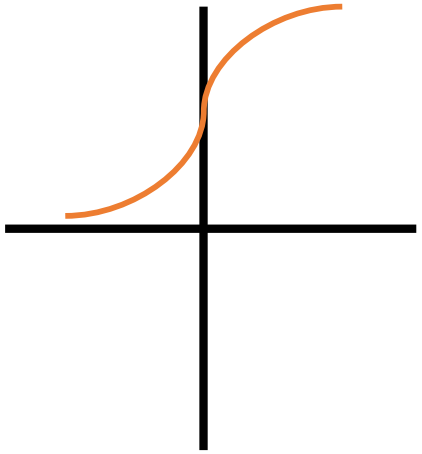
# Softmax Activation



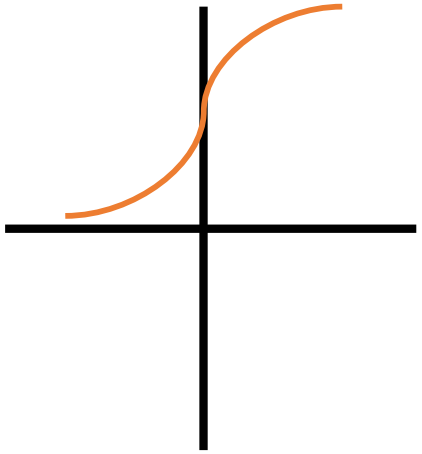
**Very common activation function**

Softmax(X) returns a number between 0 & 1

This output is equivalent to a probability

Softmax is generally used in multi class classification

# Softmax Activation



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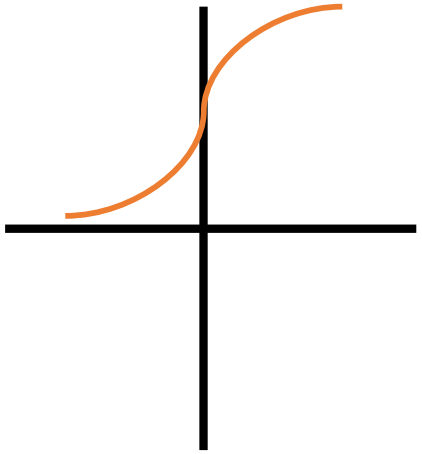

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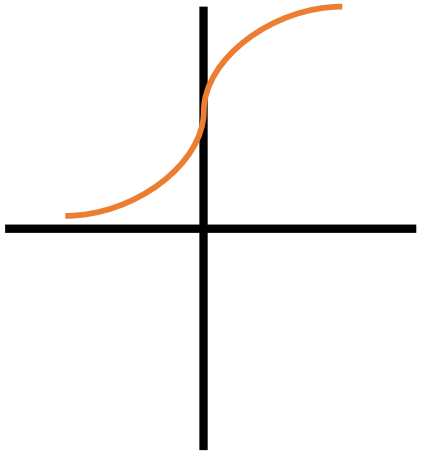

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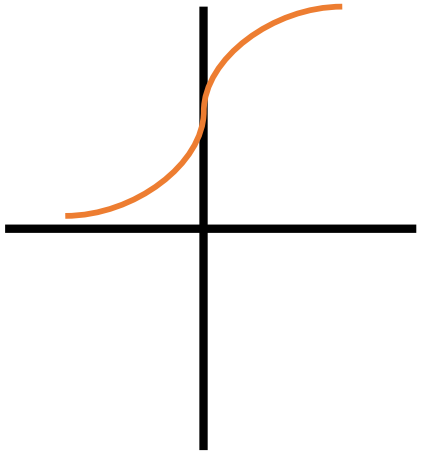
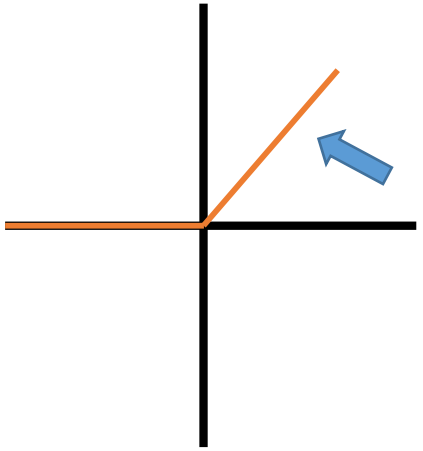
# Choose the correct activation function

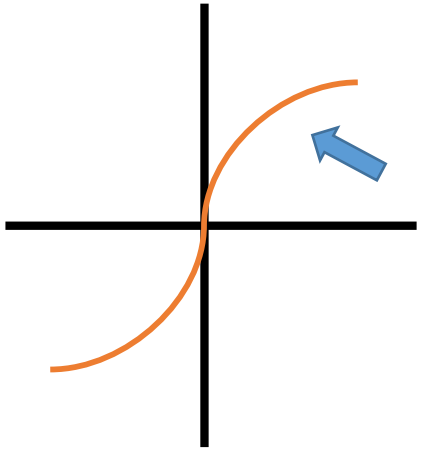


Choice of activation function depends on the problem being solved

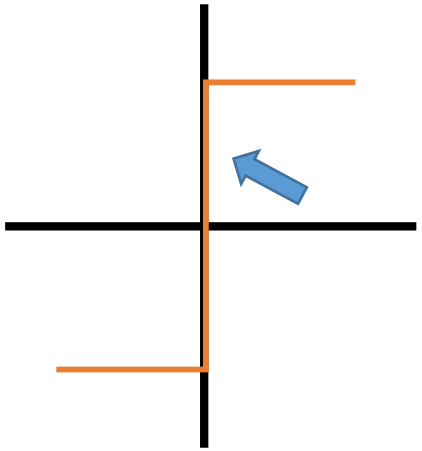
# Regions of an activation function



ReLU



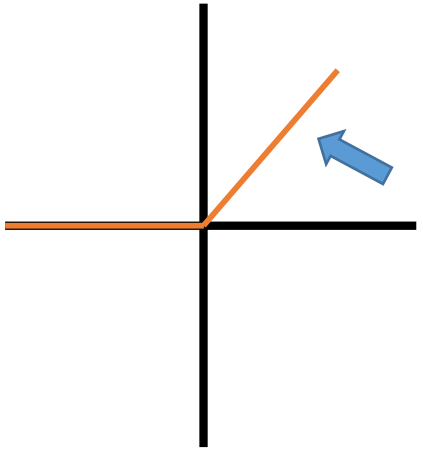
tanh



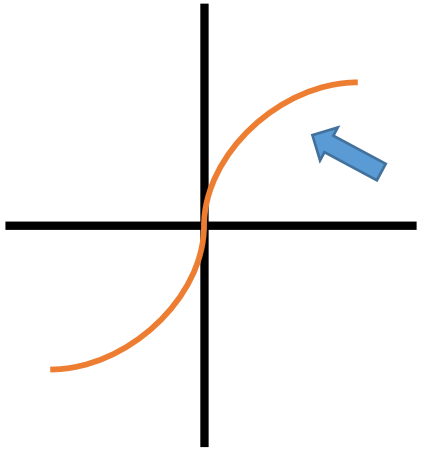
step

Region where activation function changes based on input is called the active region

# Regions of an activation function



ReLU



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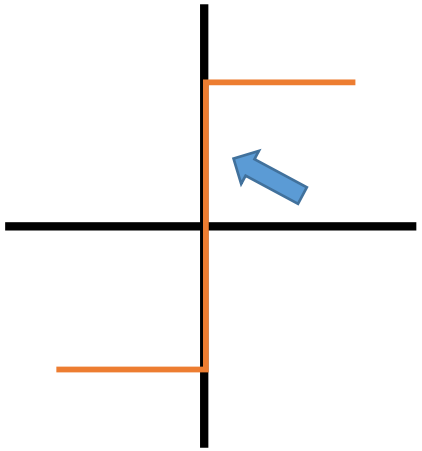
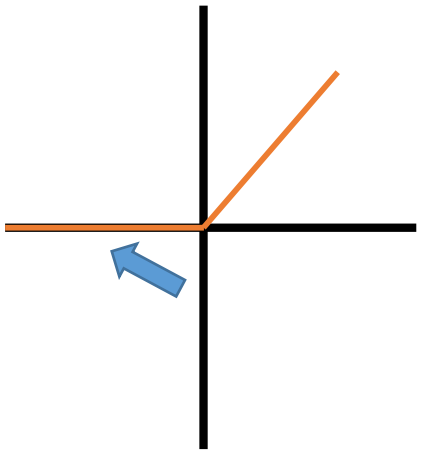


step

To train and adjust the weights of a neural network, activation functions must work in their active regions

# Regions of an activation function



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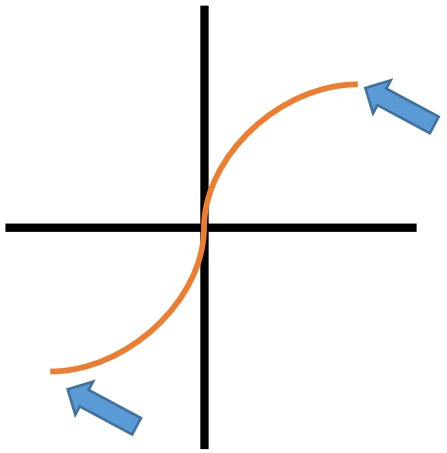
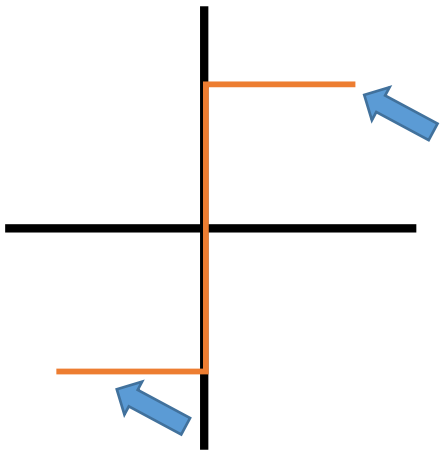


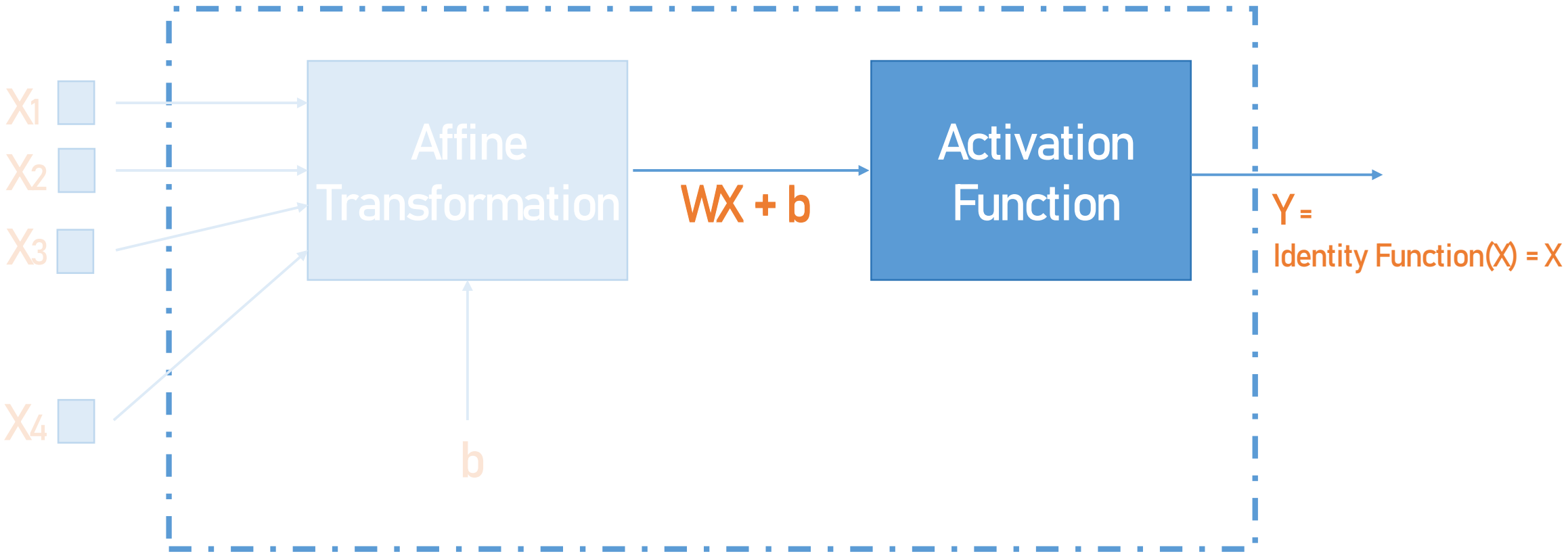
tanh



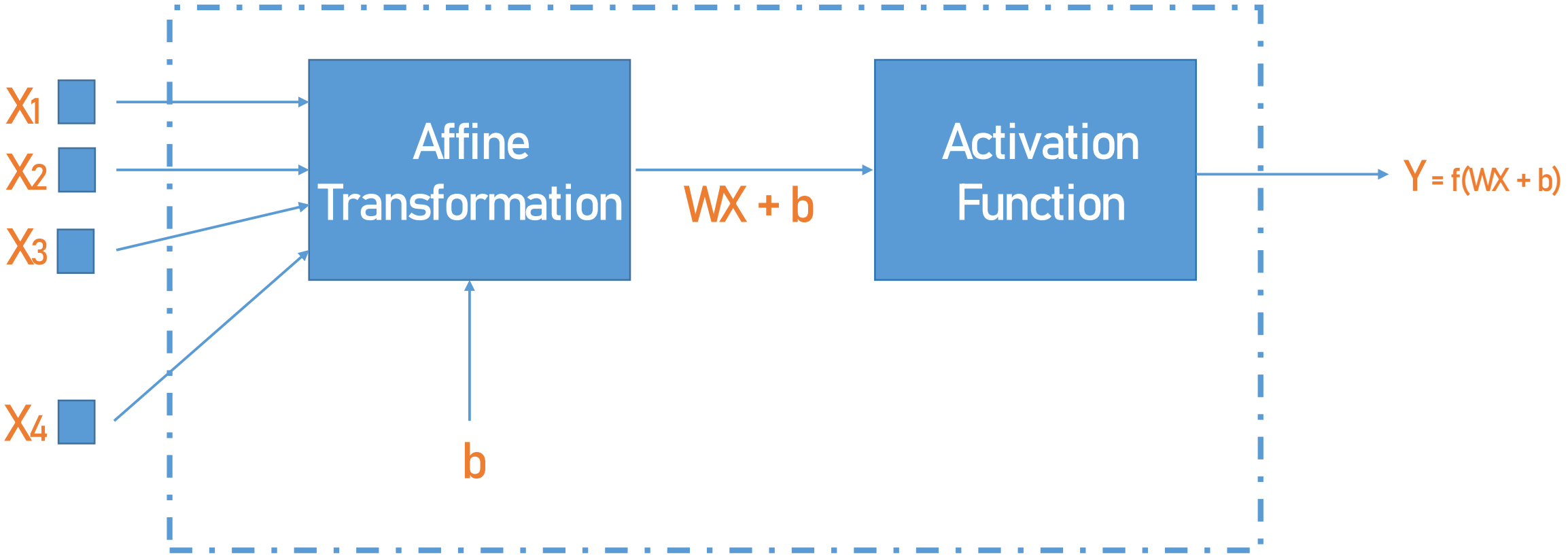
step

Region where activation function never changes based on input is called the saturation region

# Linear Neuron




# Zoom into a neuron




Neurons like these working together in a network can do wonders