Table 2.1 summarizes the various activation functions we've discussed in this section.

Table 2.1 A cheat sheet of the most common activation functions

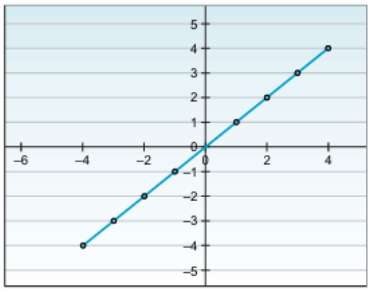
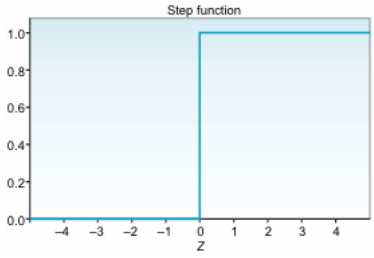
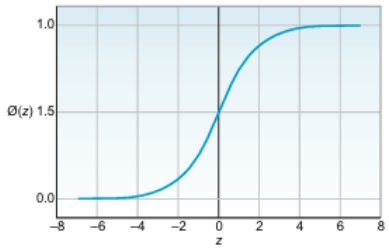
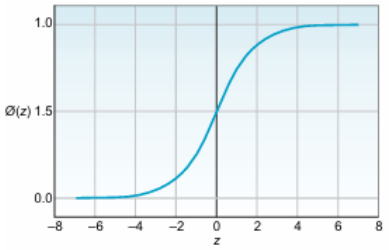
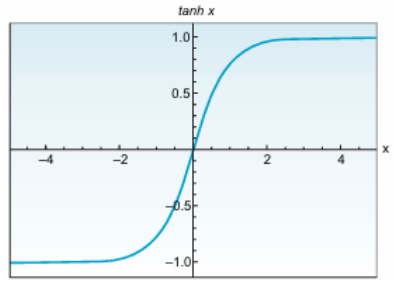
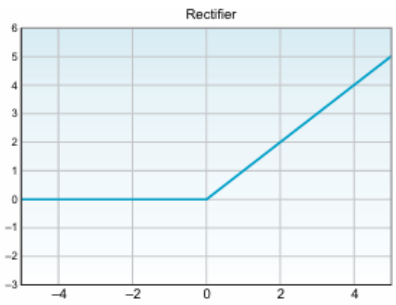
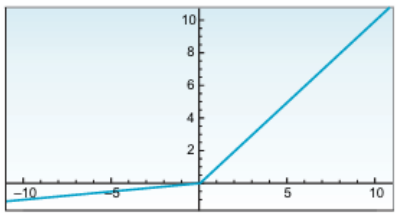
Activation function	Description	Plot	Equation
Linear transfer function (identity function)	The signal passes through it unchanged. It remains a linear function. Almost never used.		$f(x) = x$
Heaviside step function (binary classifier)	Produces a binary output of 0 or 1. Mainly used in binary classification to give a discrete value.		$\text{output} = \begin{cases} 0 \text{ if } w \cdot x + b \leq 0 \\ 1 \text{ if } w \cdot x + b > 0 \end{cases}$

Table 2.1 A cheat sheet of the most common activation functions

Activation function	Description	Plot	Equation
Sigmoid/ logistic function	Squishes all the values to a probability between 0 and 1, which reduces extreme values or outliers in the data. Usually used to classify two classes.		$\sigma(z) = \frac{1}{1+e^{-z}}$
Softmax function	A generalization of the sigmoid function. Used to obtain classification probabilities when we have more than two classes.		$\sigma(x_j) = \frac{e^{x_j}}{\sum_i e^{x_i}}$
Hyperbolic tangent function (tanh)	Squishes all values to the range of –1 to 1. Tanh almost always works better than the sigmoid function in hidden layers.		$\tanh(x) = \frac{\sinh(x)}{\cosh(x)} = \frac{e^{x}-e^{-x}}{e^{x}+e^{-x}}$

Rectified linear unit (ReLU)	Activates a node only if the input is above zero. Always recommended for hidden layers. Better than tanh.		$f(x) = \max(0, x)$
Leaky ReLU	Instead of having the function be zero when $x < 0$, leaky ReLU introduces a small negative slope (around 0.01) when (x) is negative.		$f(x) = \max(0.01x, x)$