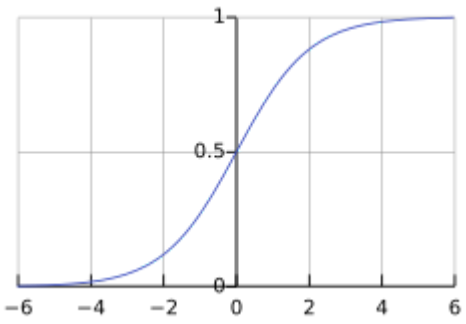
Sigmoid Function

Sigmoid Function is a mathematical function that have "S" shaped curve

$$S(x) = \frac{1}{1 + e^{-x}} = \frac{e^x}{e^x + 1}$$

- It Convert the X into values that falls in the interval between 1 and 0



- Used in the Logistic Regression which models the **Probability** that a binary outcome variable equals 1 given set of predictors
- $S(0) = 0.5$ That's where the function transitions fastest
- Its Great for modeling **non-linear boundaries**

Formula Explained

$$S(x) = \frac{1}{1 + e^{-1}}$$

- e^{-x} inverse of $\frac{1}{e^x}$
- $\lim_{x \to -\infty} e^{-x} = +\infty$
- $\lim_{x \to 0} e^{-x} = 1$
- $\lim_{x \to +\infty} e^{-x} = 0$

Based on the limits of the inverse e^{-x}

$$\lim_{x \to -\infty} S(x) = \frac{1}{1 + e^{-1}} = \frac{1}{1 + \infty} = 0$$

- The **Sigmoid** goes towards zero when x is negative

$$\lim_{x \to 0} S(x) = \frac{1}{1 + e^{-1}} = \frac{1}{1 + 1} = 0.5$$

$$\lim_{x \to +\infty} S(x) = \frac{1}{1 + e^{-1}} = \frac{1}{1 + 0} = 1$$

- 1 and 0 are the upper and lower bound for the **Sigmoid** function