**Decision Boundary**

In order to get our discrete 0 or 1 classification, we can translate the output of the hypothesis function as follows:

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| *hθ*(*x*) ≥ 0.5 → *y* = 1  *hθ*(*x*) < 0.5 → *y* = 0 |

The way our logistic function g behaves is that when its input is greater than or equal to zero, its output is greater than or equal to 0.5:

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| --- |
| *g*(*z*) ≥ 0.5 when *z* ≥ 0 |

Remember.

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| *z* = 0, e0 = 1 ⇒ *g*(*z*) = 1/2  *z* → ∞, e−∞ → 0 ⇒ *g*(*z*) = 1  *z* → −∞, e∞ → ∞ ⇒ *g*(*z*) = 0 |

So if our input to g is *θTX*, then that means:

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| *hθ*(*x*) = *g*(*θTx*) ≥ 0.5 when *θTx* ≥ 0 |

From these statements we can now say:

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| *θTx* ≥ 0 ⇒ y = 1  *θTx* < 0 ⇒ y = 0 |

The **decision boundary** is the line that separates the area where y = 0 and where y = 1. It is created by our hypothesis function.

**Example**:

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| *θ* =  *y* = 1 *if*  5 + (−1)*x*1 + 0*x*2 ≥ 0  5 − *x*1 ≥ 0  − *x*1 ≥ −5  *x*1 ≤ 5 |

In this case, our decision boundary is a straight vertical line placed on the graph where *x*1 =5, and everything to the left of that denotes y = 1, while everything to the right denotes y = 0.

Again, the input to the sigmoid function g(z) (e.g. *θTX*) doesn't need to be linear, and could be a function that describes a circle (e.g. *z* = *θ*0 + *θ*1*x*12 + *θ*2*x*22) or any shape to fit our data.