**Q1. Sigmoid Classification with New Values**

You are given a feature vector `x = [2, 4]`, weight vector `w = [0.5, -0.3]`, and bias `b = 0.2`.

**Tasks**:

- (a) Compute the linear combination: $z=w \cdot x+b$

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  $z=(0.5)(2)+(-0.3)(4)+0.2=1.0-1.2+0.2=0.0$

  **z = 0.0**

- (b) Apply the sigmoid function: $\sigma(z) = \frac{1}{1+e^{-z}}$

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  σ(0) = 1/1+e^0 = 0.5

  **Sigmoid output = 0.5**

- (c) Predict the class label using threshold 0.5

  If $\sigma(z) \geq 0.5 \Rightarrow$ class=1; else 0.

  $0.5 \geq 0.5 \Rightarrow$ Predicted class=1

  **Predicted class label = 1**