**Machine Learning**

Logistic Regression

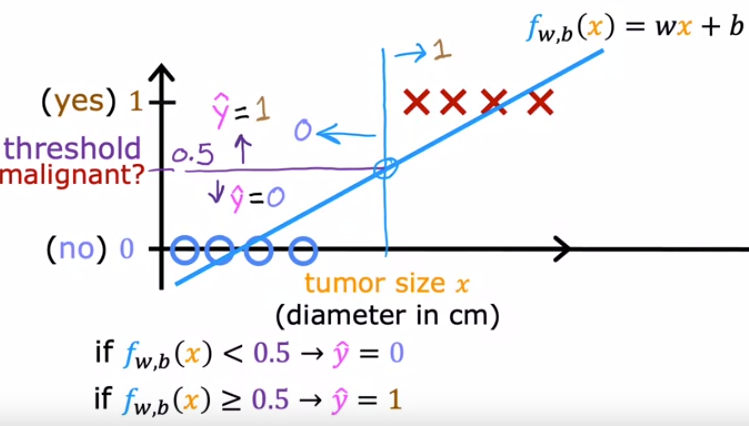
Why??

We need a way to use machine learning in classifying data, so the easiest way is by using a binary classification which is described by logistic regression.

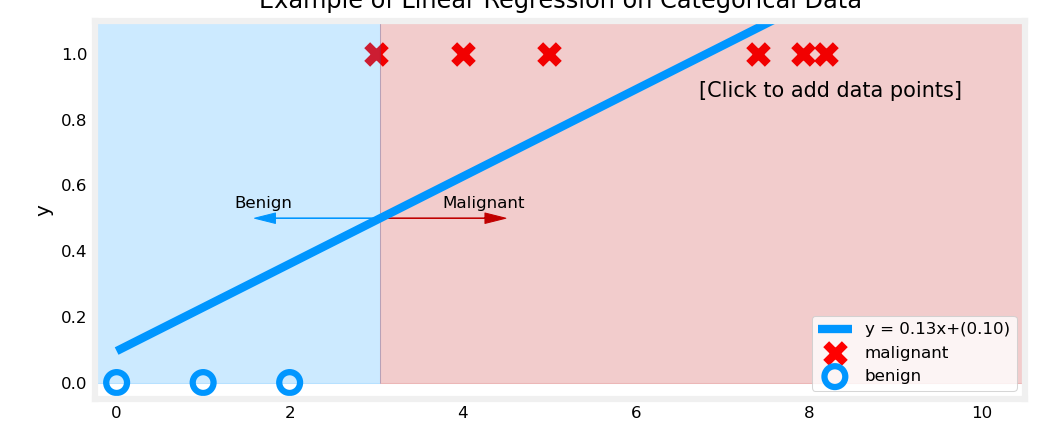
Which function do we use in logistic regression?

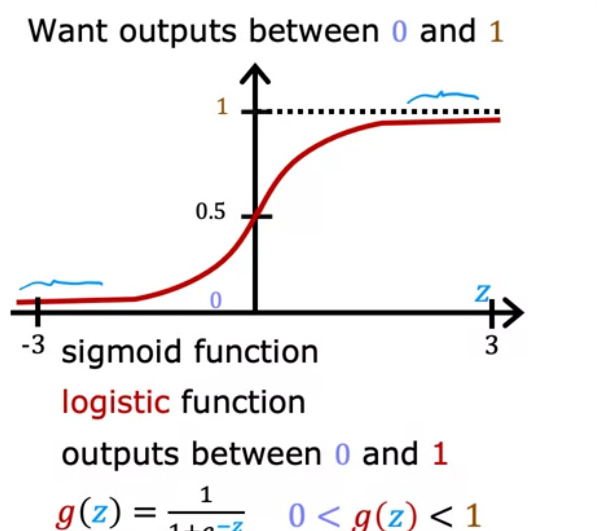
We use sigmoid function, but why not linear as the previous one?

Ok, when we use linear regression line in a classification type it might be okay, but it has a chance to be one of the worst decisions you might choose.

it’s okay for this data-set

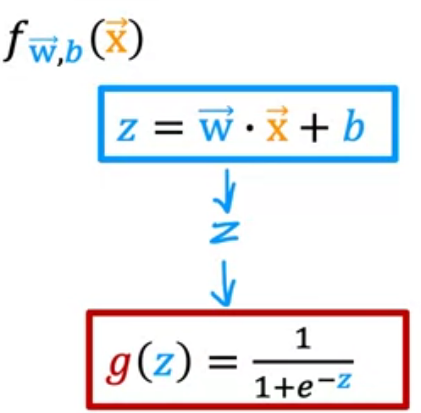
but if we had unfair distribution of the data-set the model would be misleading like the following example



So, we need a function

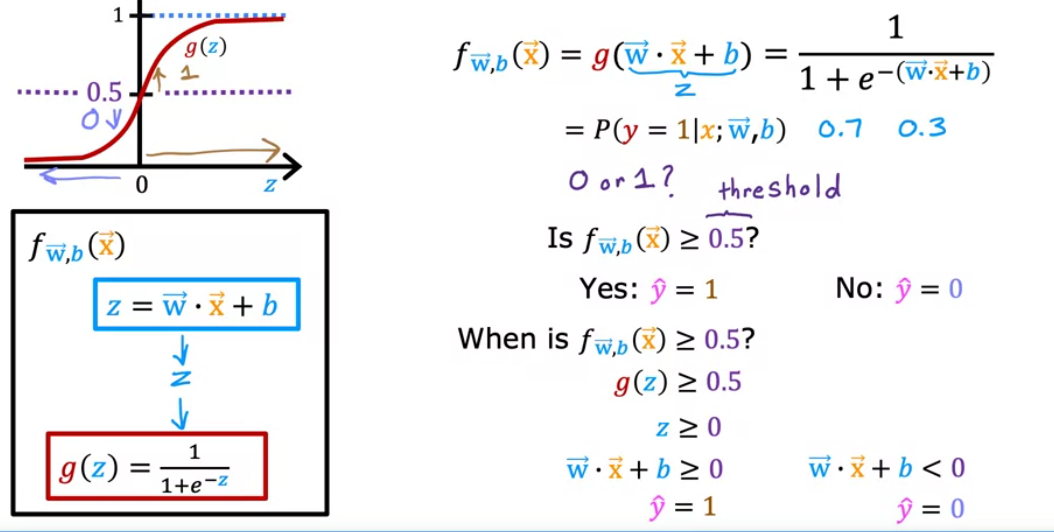
that isn’t affected by that which is

sigmoid function.



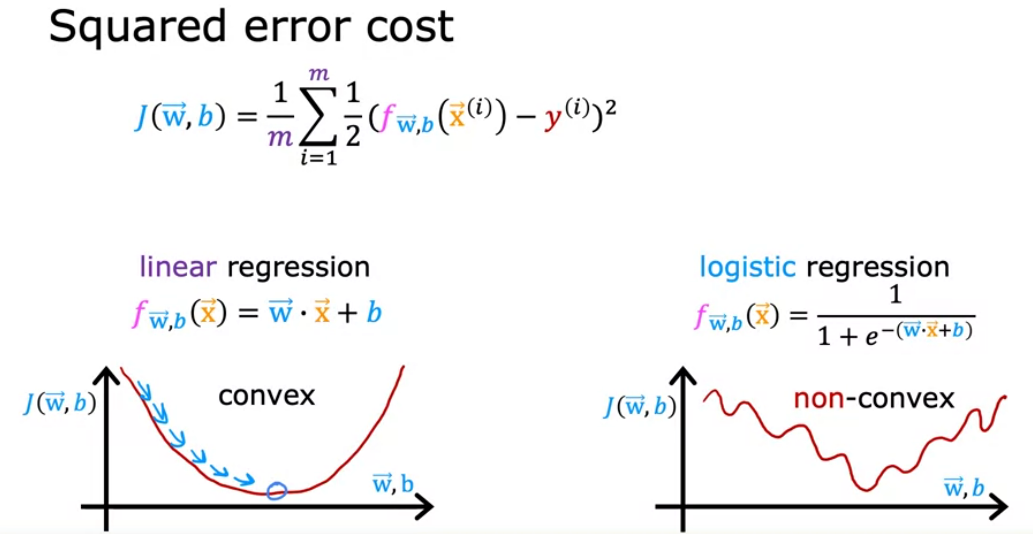
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Decision boundary

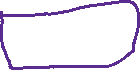




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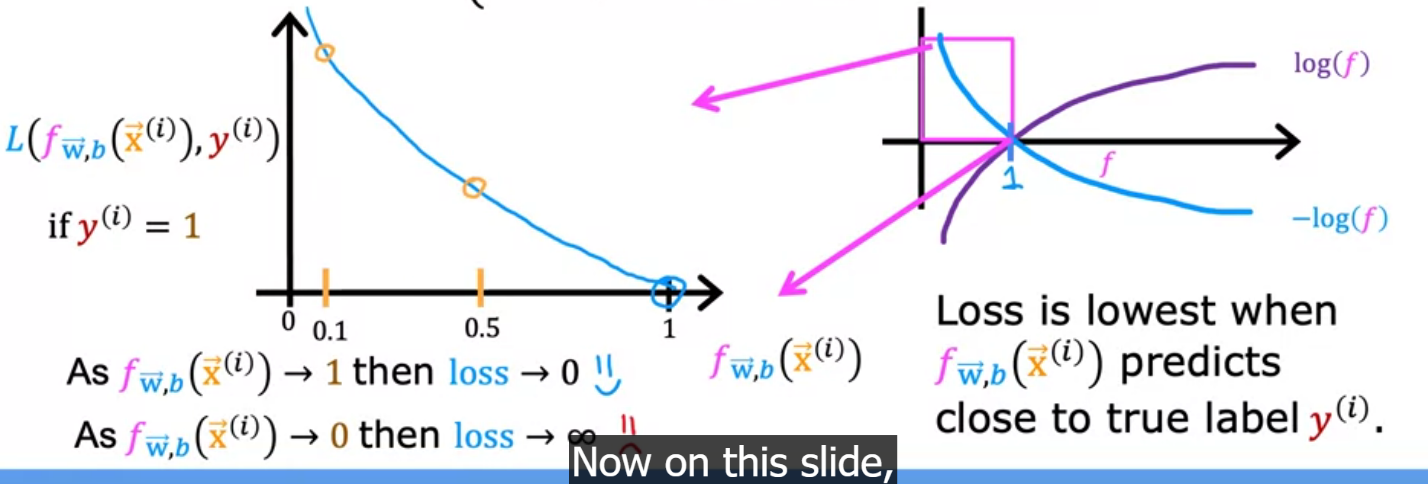
Cost function

When we use SME function to calculate the cost for logistic regression it appears that it isn’t convex

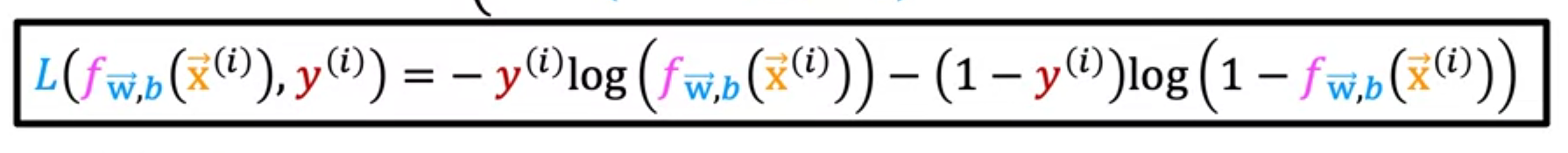


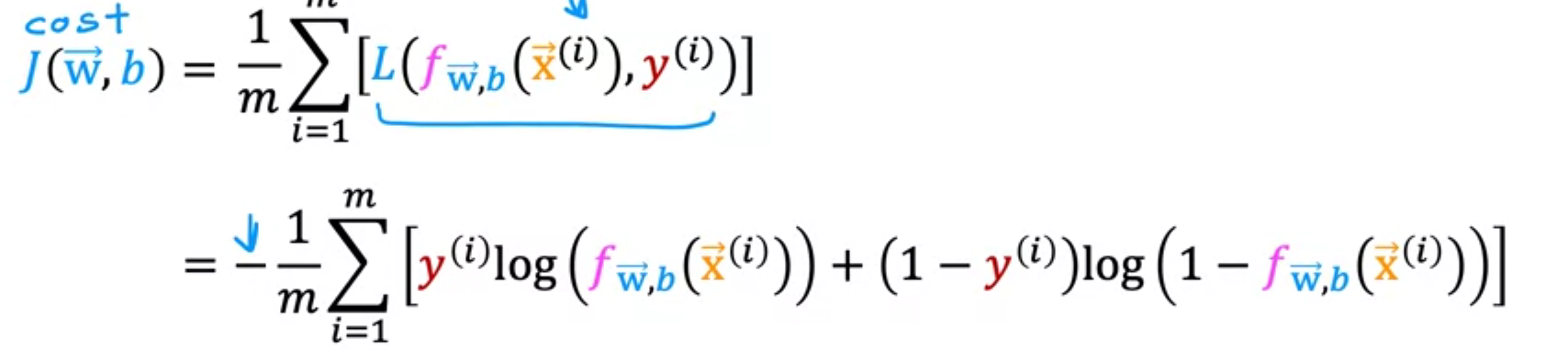
A math equations and formulas

Description automatically generated with medium confidenceA graph of mathematical equations

Description automatically generated

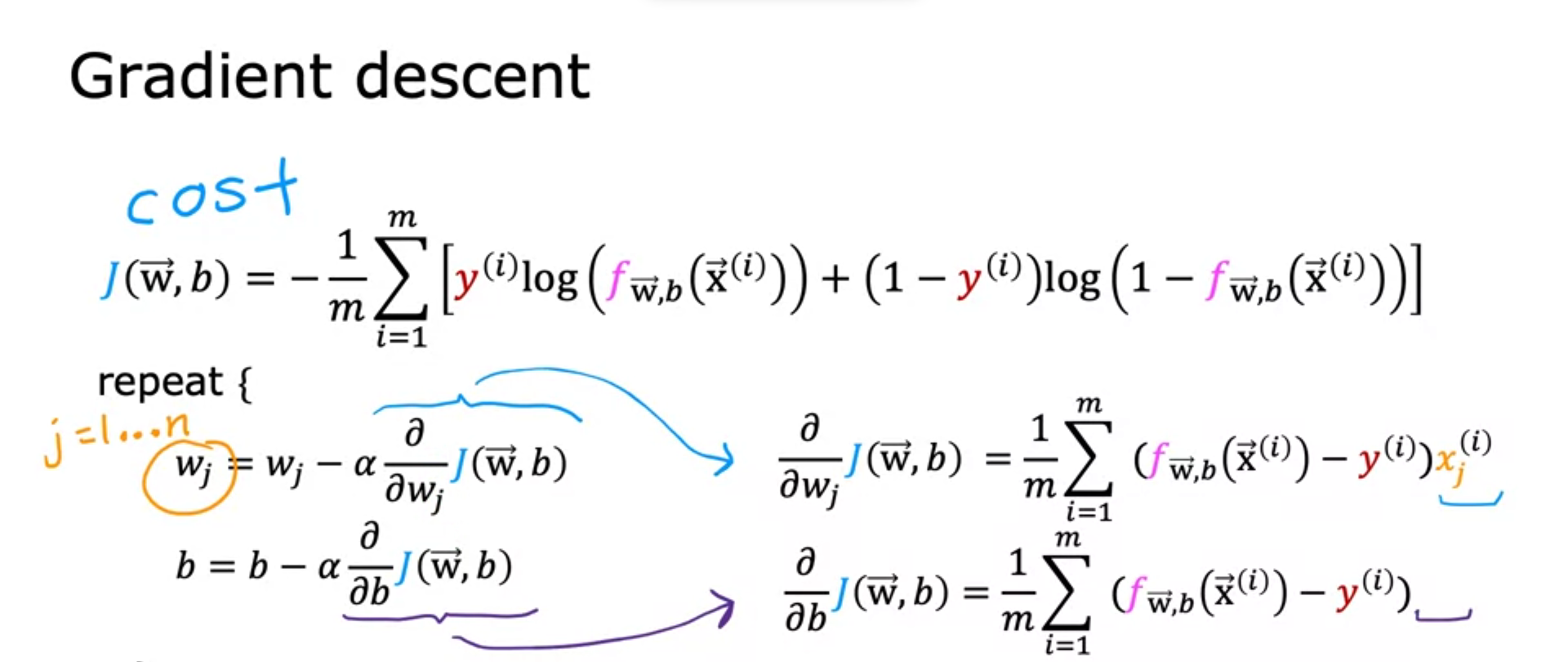
Simpler way to write cost function





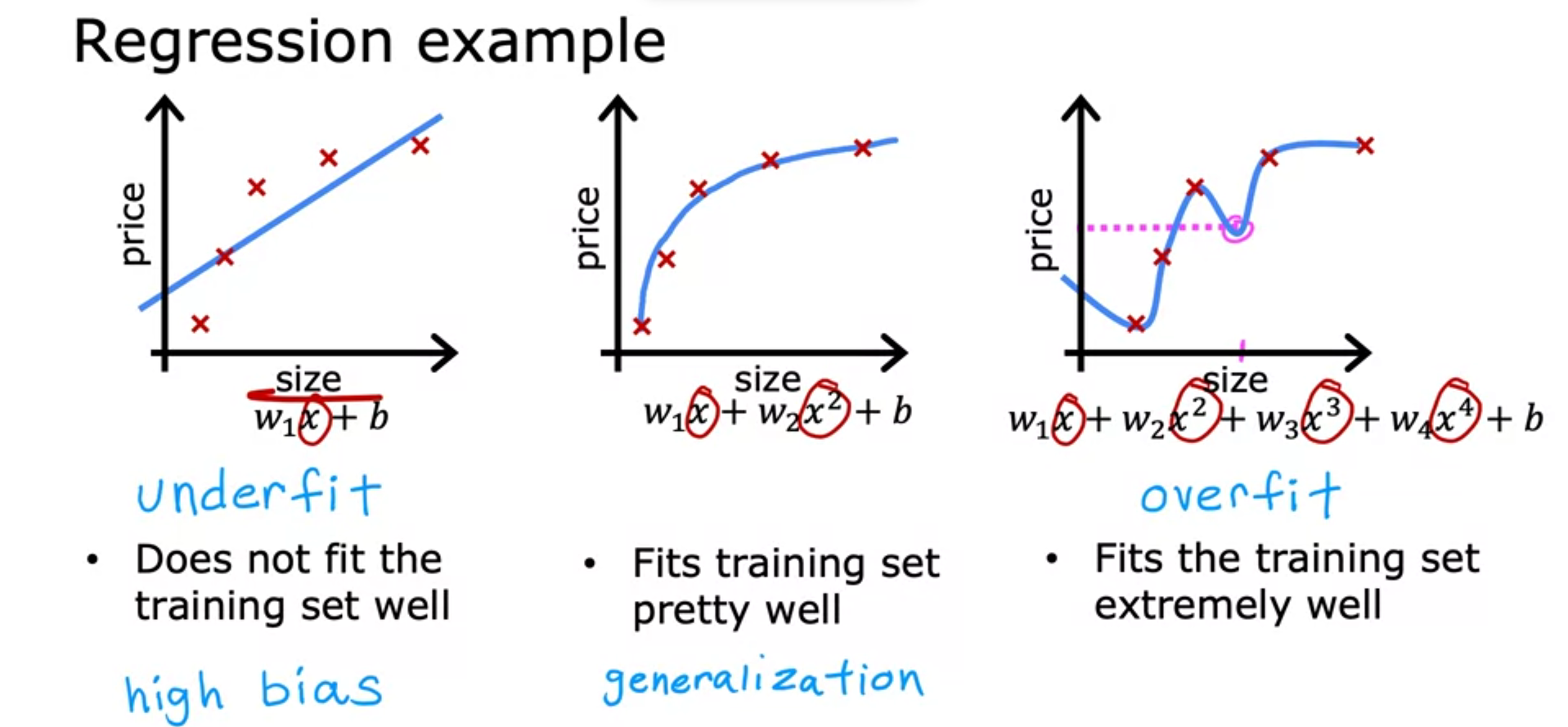
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Gradient Descent



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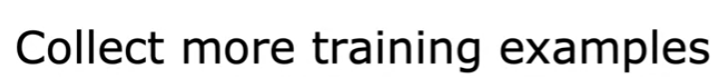
Problem of over-fitting (high variance) and under-fitting (high bias)



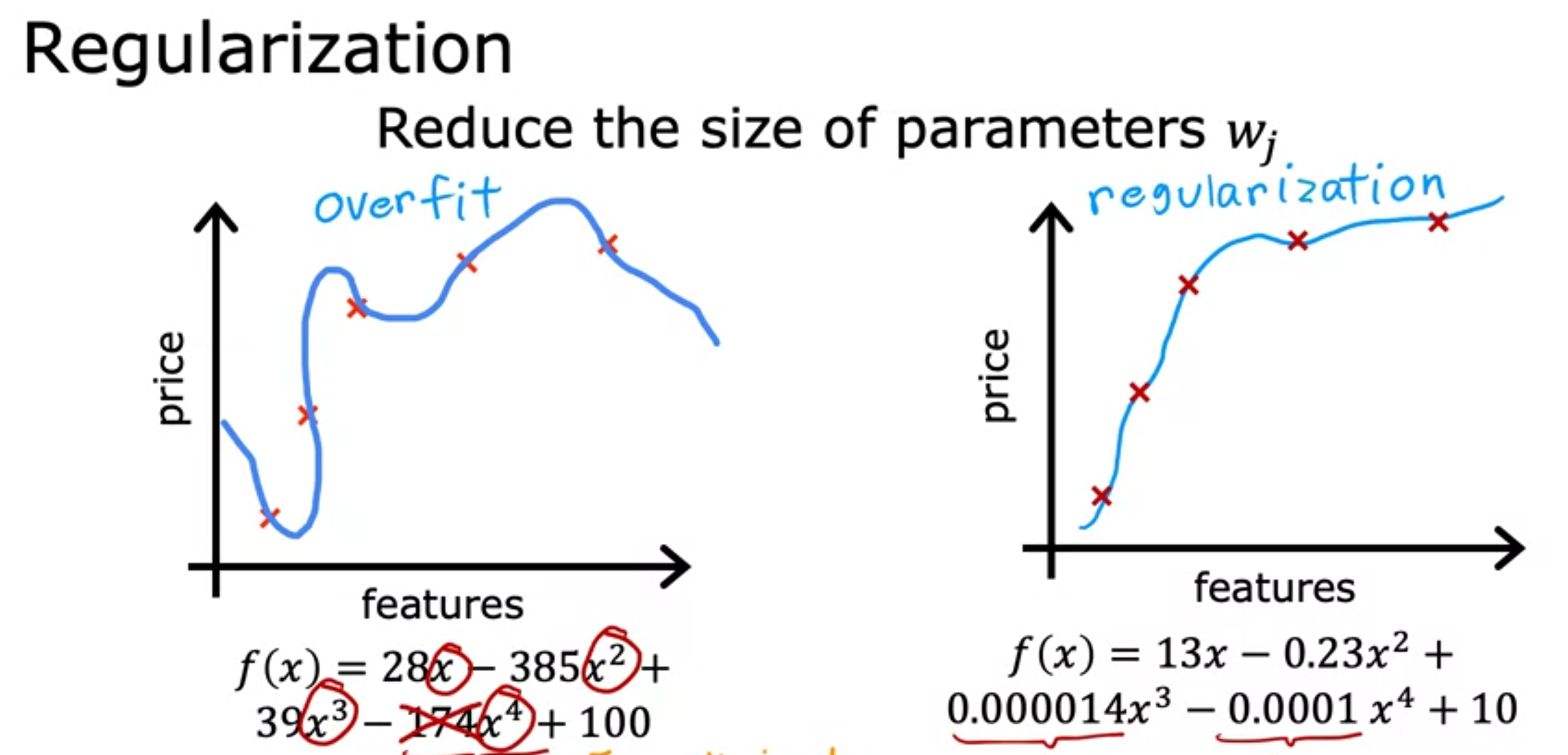
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Regularization to reduce overfitting

To reduce overfitting there is several ways to do

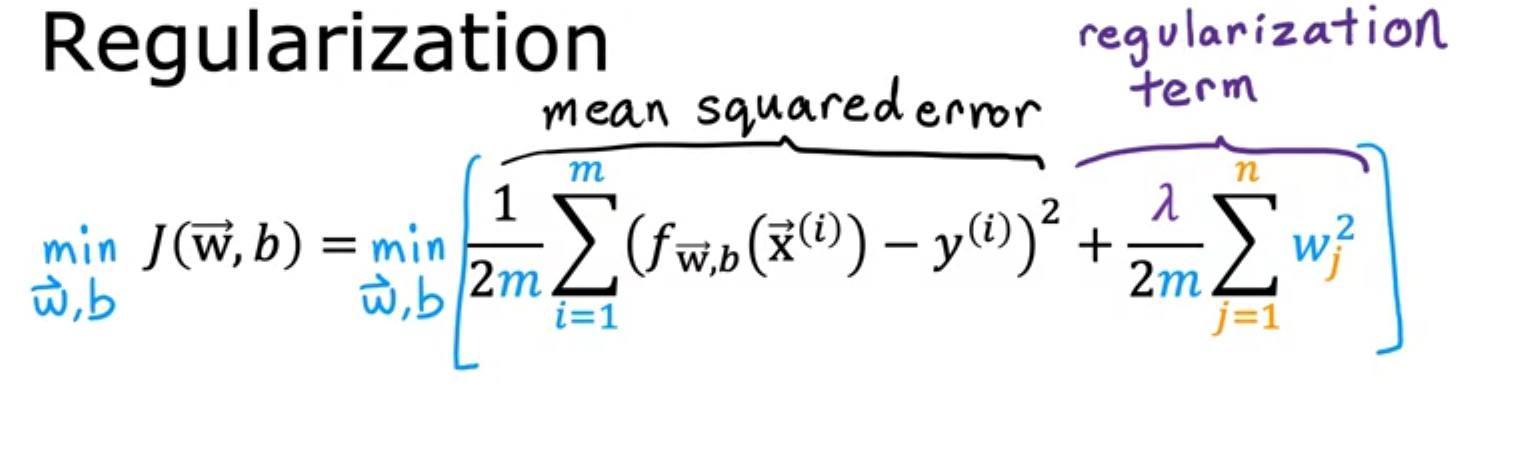




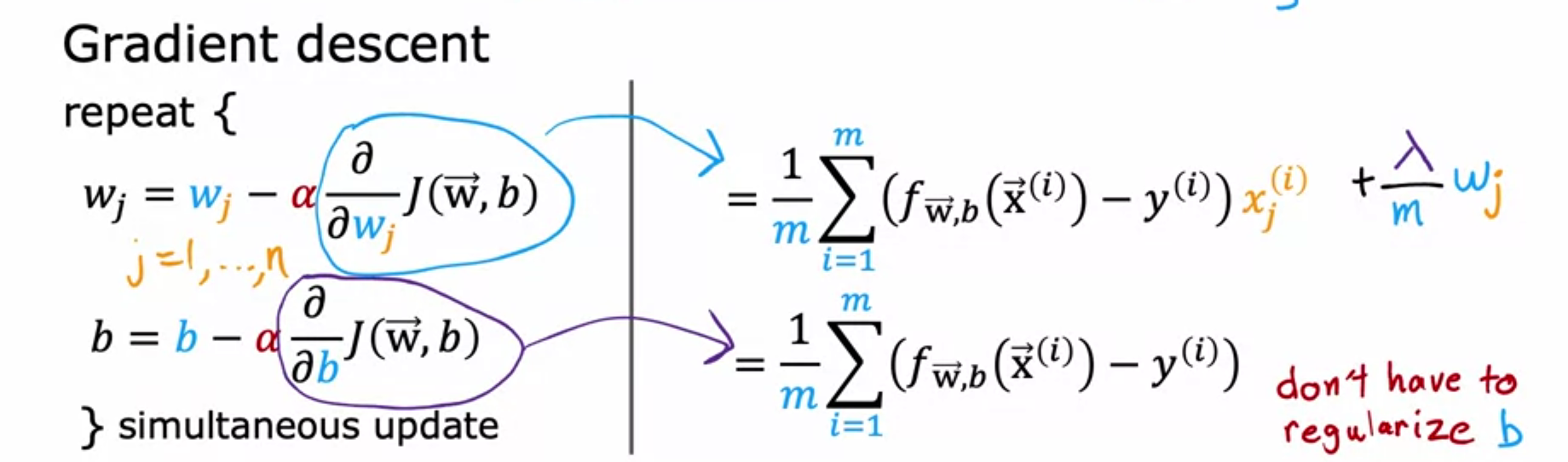


A math equations on a white background

Description automatically generated



For linear regression



For logistic regression

