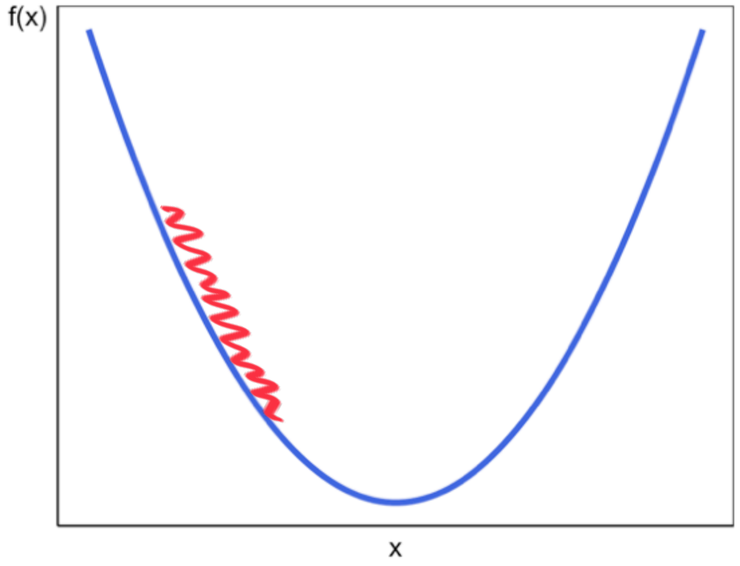
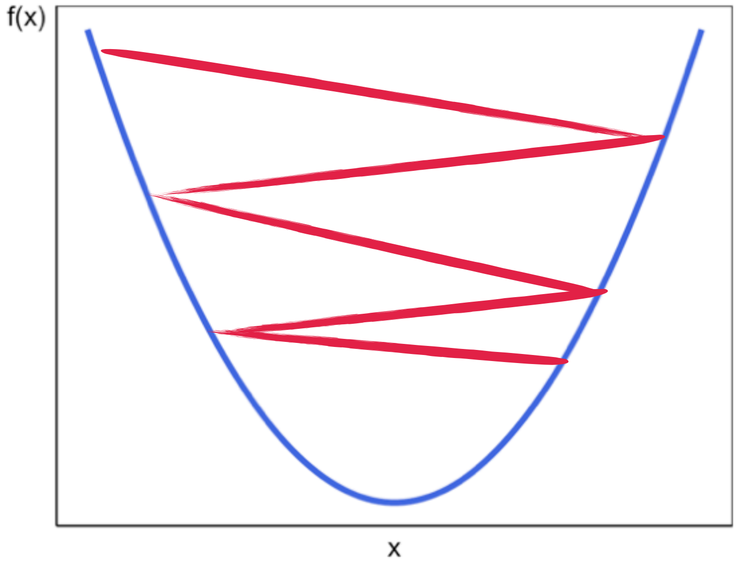
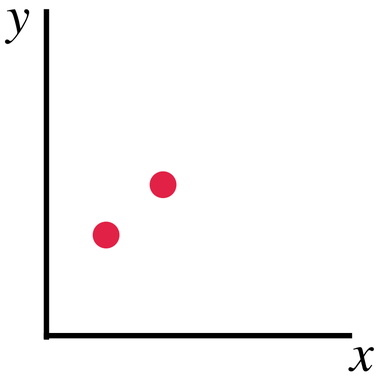
Estimation: Gradient Descent

- The goal is to minimize the loss function
- The gradient tells us which direction to move
- The **Learning Rate** controls how big of a step we take
  - Small steps mean slower convergence
  - Large steps mean we might step over minima





Example: Very Simple Linear Regression



$$\hat{y} = b_0 + b_1 x$$

Loss function:

$$RSS = \sum_i^N (\text{actual - predicted})^2 = \sum_i^N (y_i - \hat{y}_i)^2$$

$$= \sum_i^N (y_i - (b_0 + b_1 x))^2$$

$$= \sum_i^N (y_i - b_0 - b_1 x)^2$$

Assume only 2 data points: $(x_1, y_1) = (1,2), (x_2, y_2) = (2,3)$