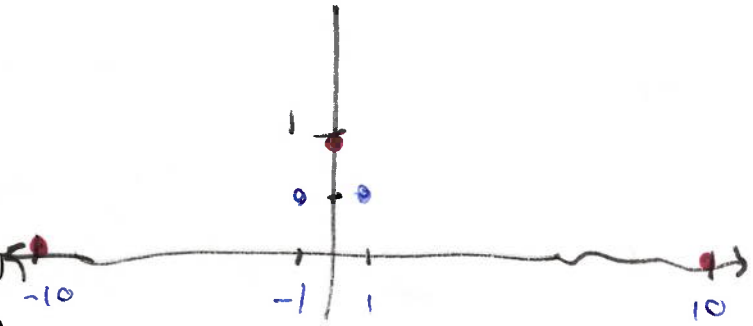
Consider the following two random variables:

$$X = \begin{cases} +1 & \text{with probability } 1/2 \\ -1 & \text{with probability } 1/2 \end{cases}$$

$\mathbb{E}(X) = 0$

$\mathbb{E}(X^2) = (1)^2 \cdot \frac{1}{2} + (-1)^2 \cdot \frac{1}{2} = 1$



$$Y = \begin{cases} +10 & \text{with probability } 1/200 \\ -10 & \text{with probability } 1/200 \\ 0 & \text{with probability } .99 \end{cases}$$

$\mathbb{E}(Y) = 0$

$\mathbb{E}(Y^2) = (10)^2 \cdot \frac{1}{200} + (-10)^2 \cdot \frac{1}{200} + 0 = \frac{100}{200} + \frac{100}{200} = 1$

What are $E(X)$, $E(Y)$, $E(X^2)$, and $\mathbb{E}(Y^2)$?

Which has higher variance, X or Y? Same

$\mathbb{E}(X^3) = 0$, $\mathbb{E}(Y^3) = 0$

$\mathbb{E}(X^4) = (1)^4 \cdot \frac{1}{2} + (-1)^4 \cdot \frac{1}{2} = \boxed{1}$

$\mathbb{E}(Y^4) = (10)^4 \cdot \frac{1}{200} + (-10)^4 \cdot \frac{1}{200} + 0 = \boxed{100}$

X: variance is from small, frequent deviations from average

Y: " " " rare, large deviations