Consider the following pmf:
p <- 0.1, 0.2, 0.3 0.4
x <- 2, 3, 4, 5
What is the variance expresed to one decimal place?

$$VAR(X) = E(X^2) - (E[X])^2$$

$$E[X] = 2(0.1) + 3(0.2) + 4(0.3) + 5(0.4) = 4$$

$$E[X^2] = 2^2(0.1) + 3^2(0.2) + 4^2(0.3) + 5^2(0.4) = 17$$

$$VAR(X) = 17 - 4^2 = \underline{1}$$

$$\boxed{VAR(X) = 1.0}$$

A random variable takes the value -4 with probability 0.2 and 1 with probability 0.8 What is the variance of this random variable?

$$VAR(X) = E[(X-\mu)^2] = E[X^2] - (E[X])^2$$

$$E[X] = (-4)(0.2) + (1)(0.8) = -0.8 + 0.8 = 0$$

$$E[X] = 0$$

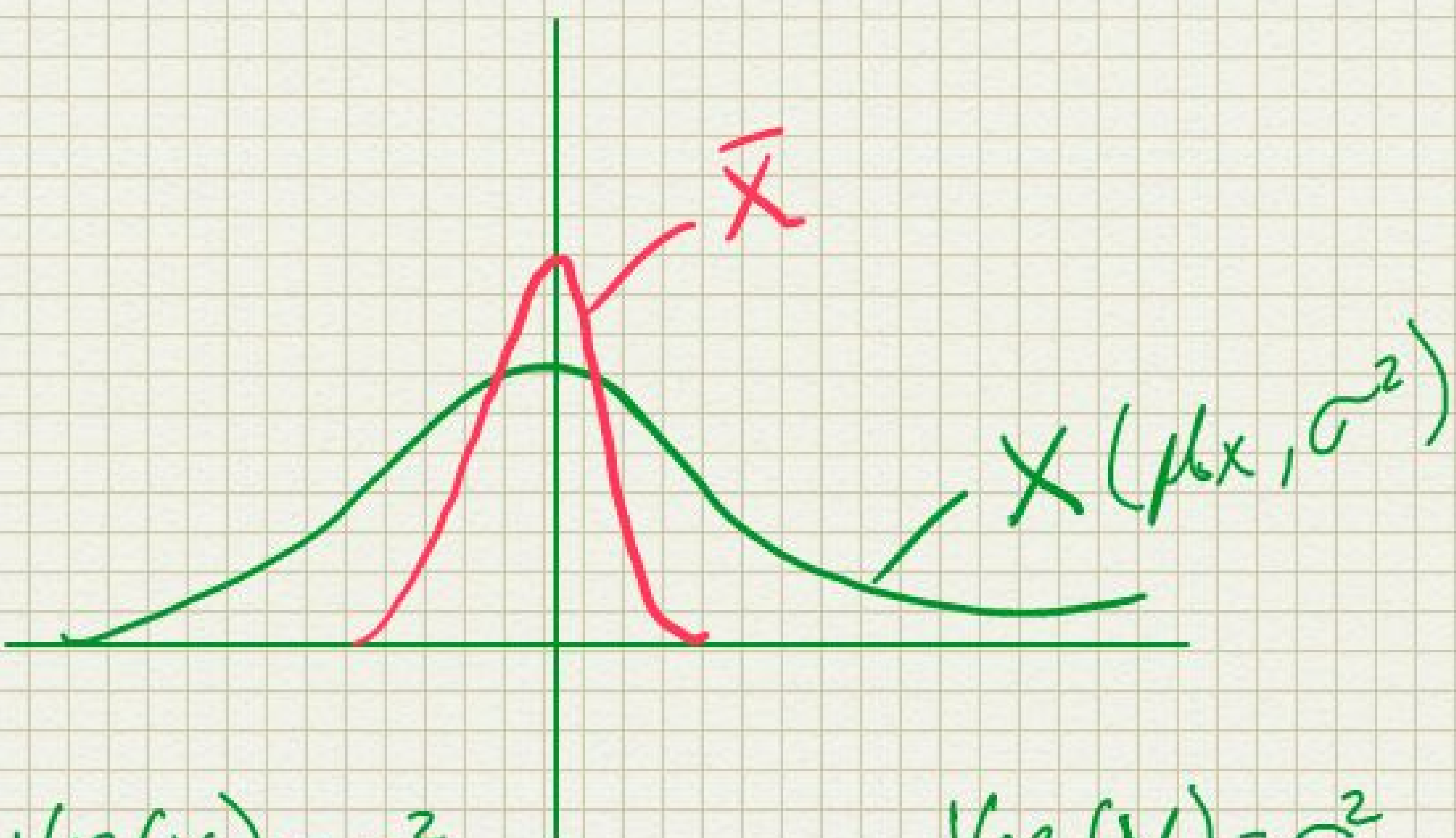
$$VAR(X) = E[X^2] - 0 = E[X^2]$$

$$E[X^2] = (-4)^2(0.2) + (1)^2(0.8) = 16(0.2) + 0.8$$

$$= 4$$

$$\boxed{VAR(X) = 4}$$

If $\overline{X}$ and $\overline{Y}$ are comprised of n iid random variables arising from distributions having means μ_x and μ_y, respectively and common variance σ^2 what is the variance $\overline{X} - \overline{Y}$?



$VAR(X) = \sigma^2$

$VAR(\overline{X}) = \sigma^2/n$

$VAR(Y) = \sigma^2$

$VAR(\overline{Y}) = \sigma^2/n$

$$VAR(\overline{X} - \overline{Y}) = VAR(\overline{X} + (-\overline{Y})) = VAR(\overline{X}) + VAR(-\overline{Y})$$

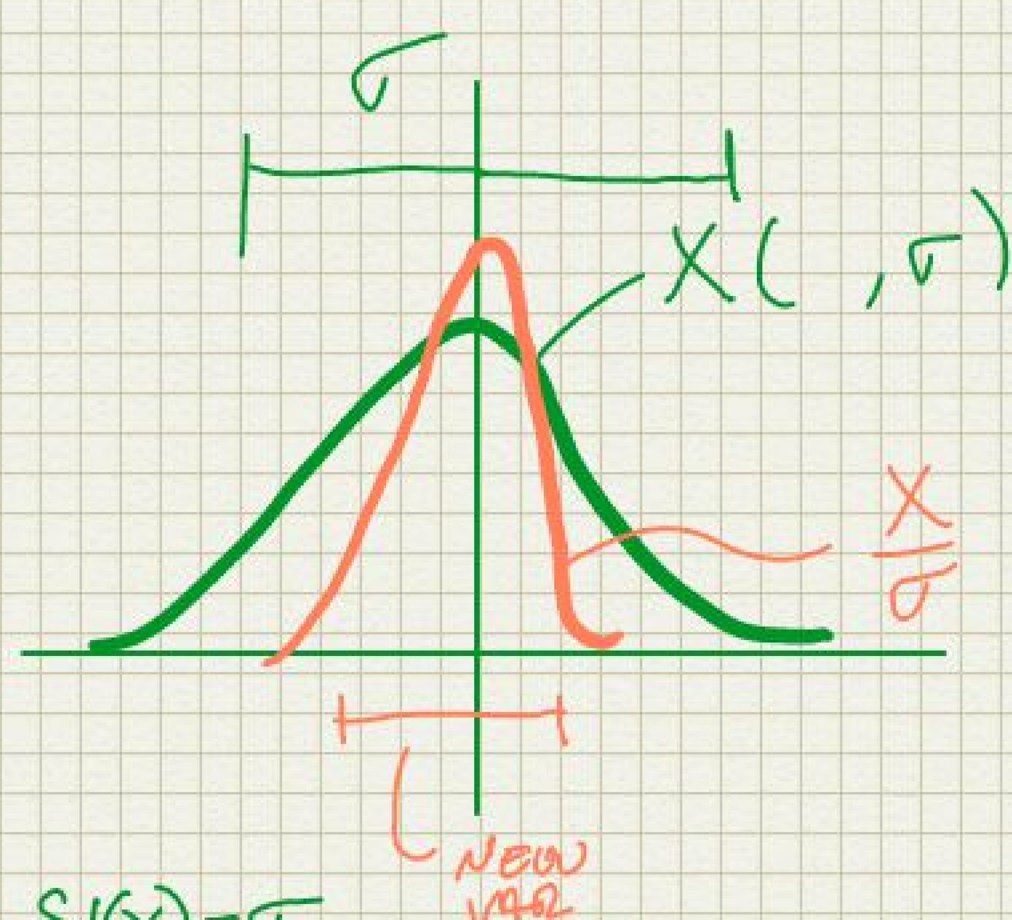
$$= VAR(\overline{X}) + (-1)^2 VAR(\overline{Y})$$

$$= VAR(\overline{X}) + VAR(\overline{Y})$$

$$VAR(\overline{X} - \overline{Y}) = \frac{\sigma^2}{n} + \frac{\sigma^2}{n}$$

$$\boxed{VAR(\overline{X} - \overline{Y}) = \frac{2\sigma^2}{n}}$$

Let X be a random variable having standard deviation σ. What can be said about X / σ ?



$Sd(X) = \sigma$

$VAR(X) = \sigma^2$ $\qquad VAR(aX) = a^2 \, VAR(X)$

$$VAR\left(X/\sigma\right) = VAR\left(\frac{1}{\sigma} X\right) = \frac{1}{\sigma^2} VAR(X) = \frac{1}{\sigma^2} \sigma^2 = 1$$

$$\boxed{VAR\left(\frac{X}{\sigma}\right) = 1}$$