

Day 17

Combining Two Noisy Measurements

# Probability Density Function

- ▶ the probability that a random variable  $X$  takes on a value between  $a$  and  $b$  is

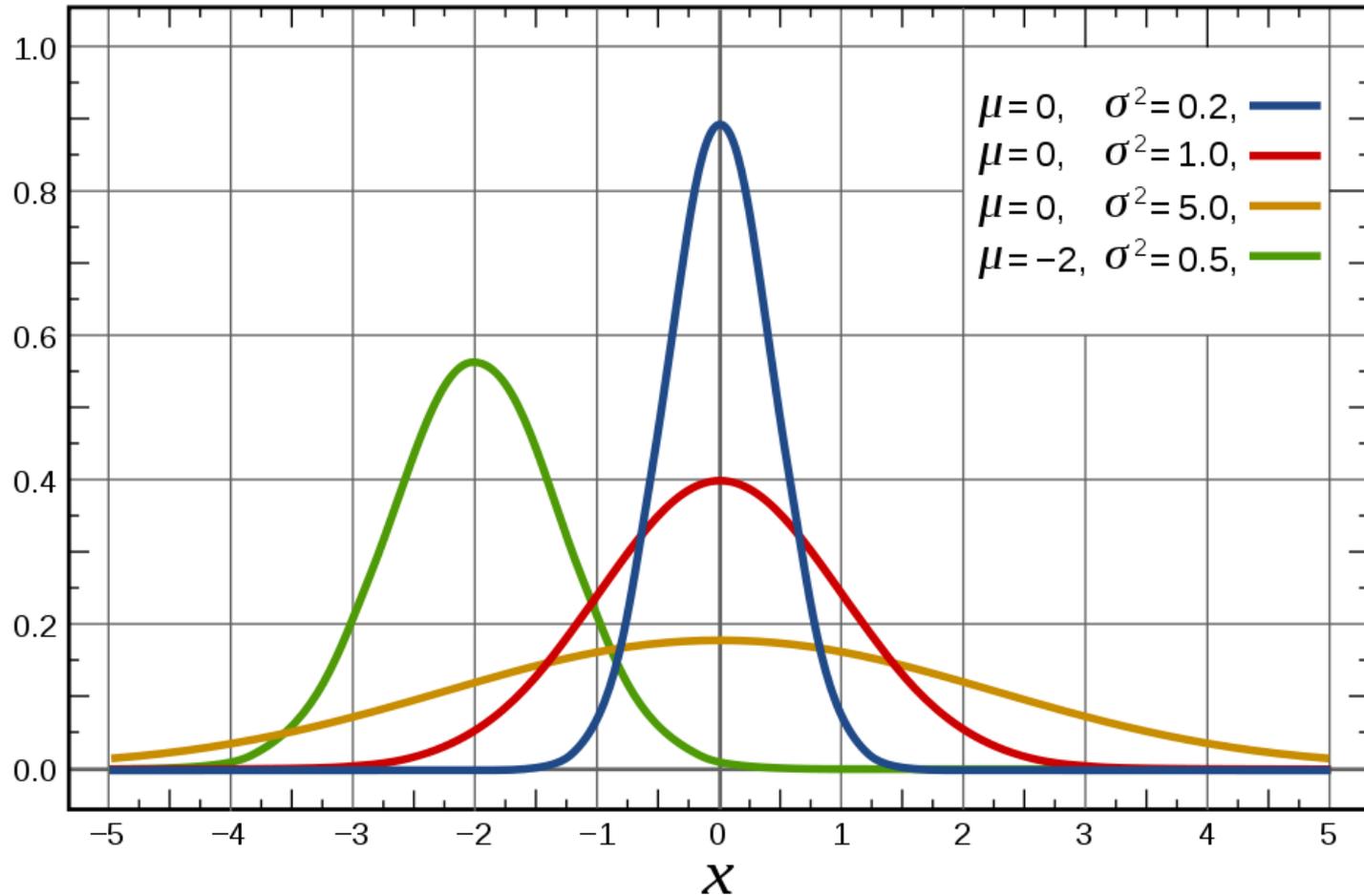
$$P[a \leq X \leq b] = \int_a^b f(x) dx$$

- ▶  $f(x)$  is called the probability density function and it is constrained by

$$\int_{-\infty}^{\infty} f(x) dx = 1$$
$$f(x) \geq 0$$

# Normal (Gaussian) Density Function

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$



# Expected Value

- ▶ informally, the expected value of a random variable  $X$  is the long-run average observed value of  $X$
- ▶ formally defined as

$$E[X] = \int_{-\infty}^{\infty} x f(x) dx$$

- ▶ properties

$$E[c] = c$$

$$E[E[X]] = E[X]$$

$$E[X + c] = E[X] + c$$

$$E[X + Y] = E[X] + E[Y]$$

$$E[cX] = cE[X]$$