Announcements

Mean and Variance for continuous RV

$$\boxed{E(X) = \int_{\text{all } x} x \cdot f(x)\,dx}$$

$$\boxed{V(X) = E(X^2) - (E(X))^2}$$

Example:

$$f(x) = \begin{cases} \frac{3}{2}(1-x^2) & 0 \le x \le 1 \\ 0 & \text{o/w} \end{cases}$$

$$E(X) = \int_0^1 x \cdot \frac{3}{2}(1-x^2)\,dx = \frac{3}{2}\int_0^1 (x - x^3)\,dx = \boxed{3/8}$$

$$E(X^2) = \int_0^1 x^2 \cdot \frac{3}{2}(1-x^2)\,dx = \frac{3}{2}\int_0^1 (x^2 - x^4)\,dx = \boxed{1/5}$$

$$V(X) = \frac{1}{5} - \left(\frac{3}{8}\right)^2 \Rightarrow \cancel{\boxed{V(X) = 0.088}}$$

$$\boxed{V(X) = 0.059}$$

$\boxed{y = \frac{1}{x^2}}$ $\quad$ $y = \frac{1}{x}$

$xy = 1$

Problem 4.22 (page 156)

The weekly demand for propane gas (in 1000s of gallons) from a particular facility is an rv X with pdf

$$f(x) = \begin{cases} 2\left(1 - \frac{1}{x^2}\right) & 1 \le x \le 2 \\ 0 & \text{otherwise} \end{cases}$$

a. Compute the cdf of X.

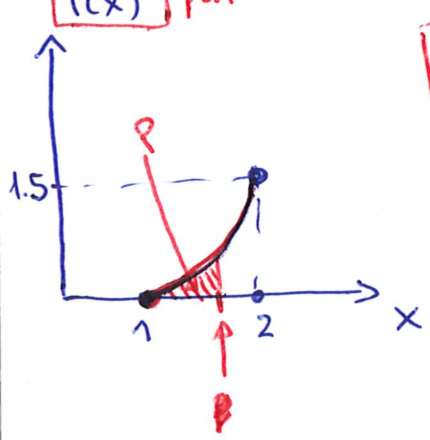
b. Obtain an expression for the (100p)th percentile. What is the value of $\tilde{\mu}$?

c. Compute $E(X)$ and $V(X)$. $E(X) = 1.614$, $V(x) = 0.0626$

d. If 1.5 thousand gallons are in stock at the beginning of the week and no new supply is due in during the week, how much of the 1.5 thousand gallons is expected to be left at the end of the week? [*Hint*: Let $h(x) =$ amount left when demand $= x$.]

(a) $F(x) = \int_1^x 2\left(1 - \frac{1}{k^2}\right) dk$ ooo solve $= \frac{2(x-1)^2}{x}$

$\boxed{f(x)}$ pdf



$$\boxed{F(x) = \begin{cases} 0 & , x < 1 \\ \frac{2(x-1)^2}{x} & , 1 \le x \le 2 \\ 1 & , x > 2 \end{cases}}$$

(b) $F(x) = \frac{2(x-1)^2}{x} = p$ $\qquad$ Solve for x

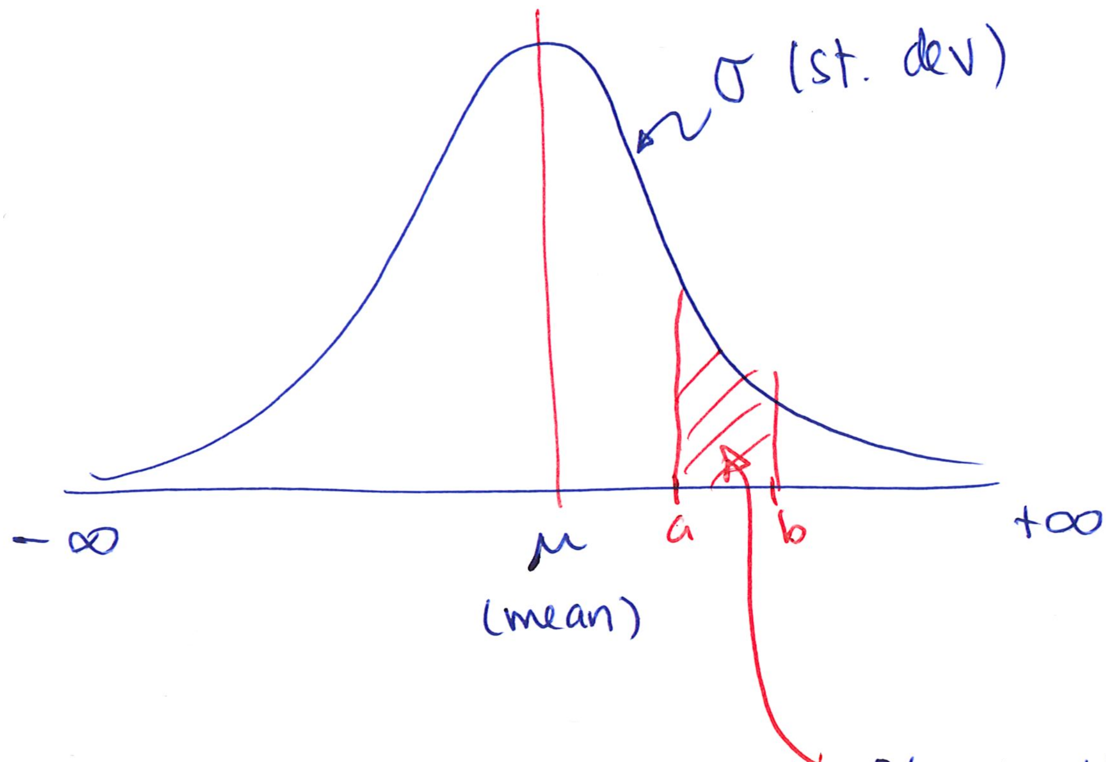
$$\boxed{x = \frac{p + 4 + \sqrt{p^2 + 8p}}{4}}$$

For the median:

$p = 0.5 \rightarrow$ $\boxed{x = 1.64}$

Normal Distribution

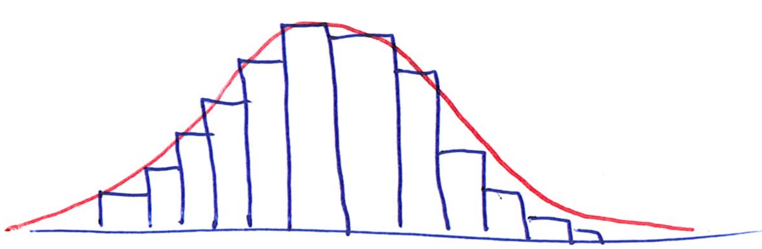
pdf: $f(x;\mu,\sigma) = \frac{1}{\sqrt{2\pi}\cdot\sigma} \cdot \exp^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$

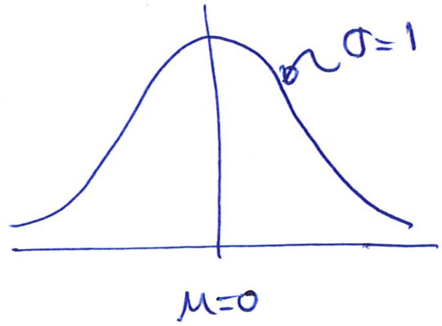


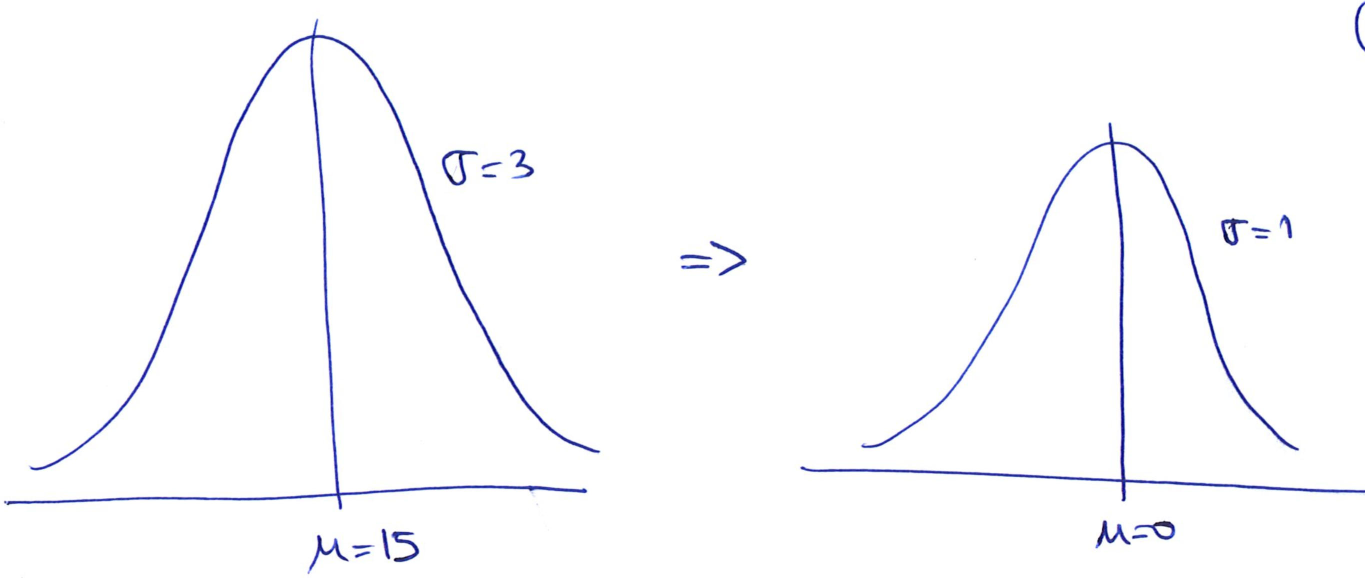
$P(a \le x \le b)$

$= \int_a^b f(x)\,dx$

Histogram







$$\boxed{Z = \frac{X - \mu}{\sigma}}$$