VI. Normal Distribution

⊥ or ⌙ perpendicular

i. Continuous random variable

A continuous random variable is representing the measurement on a continuous scale. These variables will change randomly with other factors.

eg games' result or outcomes. ← poker hands, dice ← roulettes ← sport games

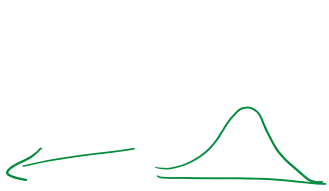
eg weather

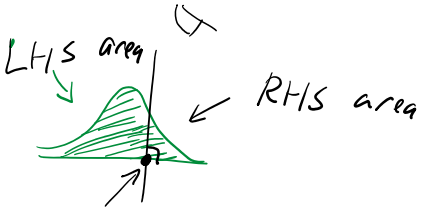
eg growth

⋮

many other processed variables.

ii. Normal Distribution





A normal distribution is when the continuous random variables form a bell-shape curve, which is the probability density function.

The other name is called "bell-curve."

Formula

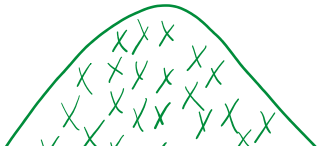
$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}(\frac{x-\mu}{\sigma})^2}$$

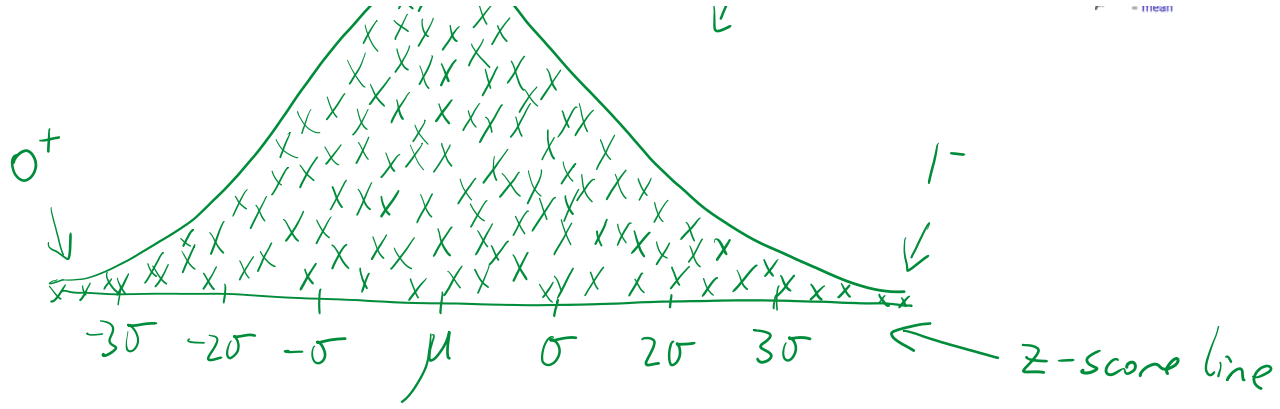
$f(x)$ = probability density function

σ = standard deviation

μ = mean

Area = Prob. = 1



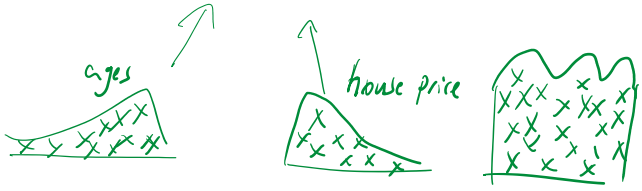


- symmetric between the left and the right of μ
- it converts the probability to z-score and vice versa.
- it is for next class's non-standard N.D.

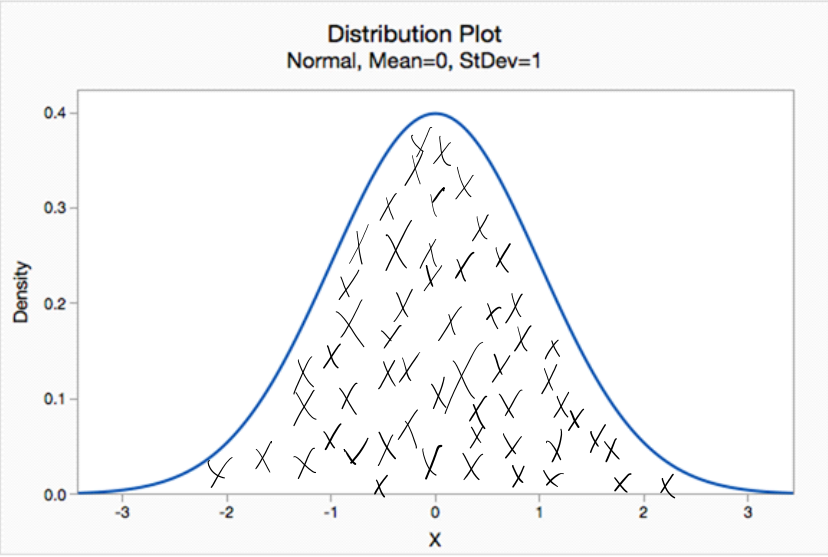
Why? It is to find probability and set it into a scale.

↑ a standardized scale

Note:  comes from taking average.



iii. Standard Normal Distribution

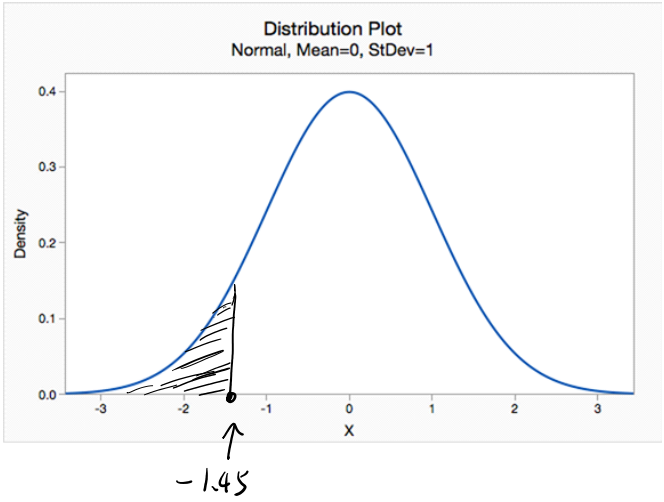


- this is unique: $\mu = 0$, $\sigma = 1$
- it is <u>not</u> important anymore. (Because of technology)

<u>Notation</u>: $\boxed{P(Z < *)}$ is find Prob when Z is $<$ cut at $*$.
$\leq$

eg Find $P(Z < -1.45)$

s:



$P(Z < -1.45) =$ Table

$= \boxed{0.0735}$

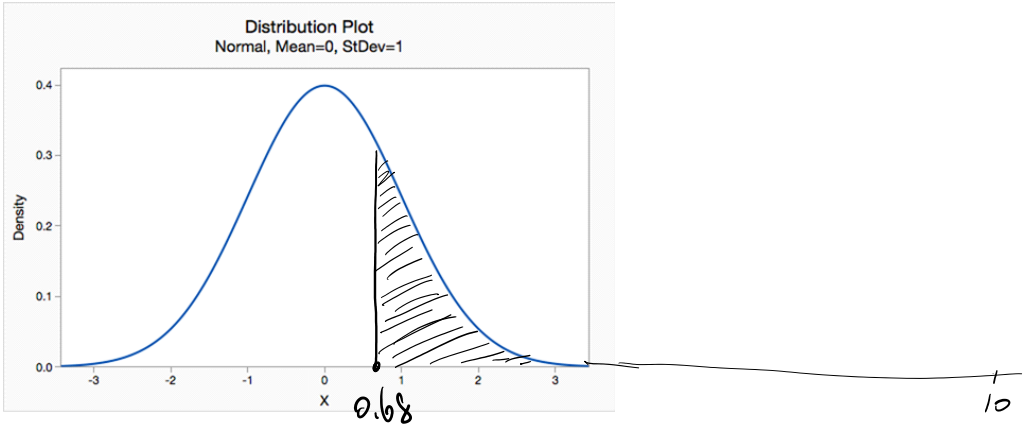
$P(z < -1.45) =$ table

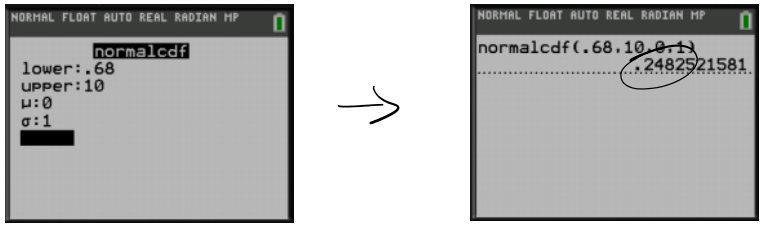
$= \boxed{0.0735}$

TI-84: 2nd → distr → 2 : normcdf(

eg Find $P(z > 0.68)$.

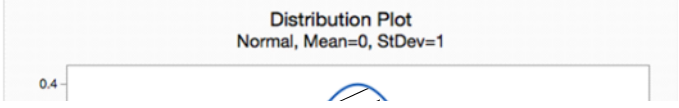
S:

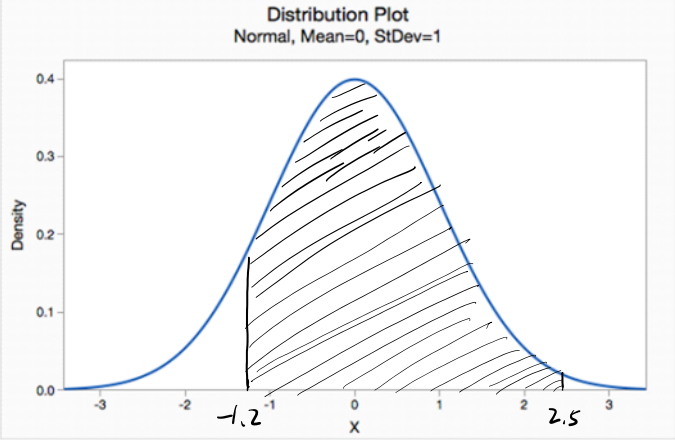


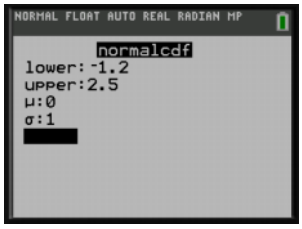


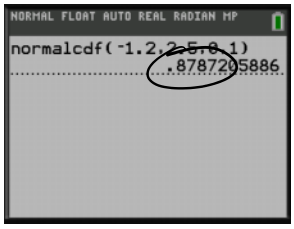
eg Find $P(-1.2 < z < 2.5)$.

S:




Distribution Plot
Normal, Mean=0, StDev=1
Density
0.4
0.3
0.2
0.1
0.0
-3
-2
-1
0
1
2
3
X
-1.2
2.5


NORMAL FLOAT AUTO REAL RADIAN MP
normalcdf
lower:-1.2
upper:2.5
μ:0
σ:1


NORMAL FLOAT AUTO REAL RADIAN MP
normalcdf(-1.2,2.5,0,1)
.8787205886