Excel Functions for Continuous Distributions

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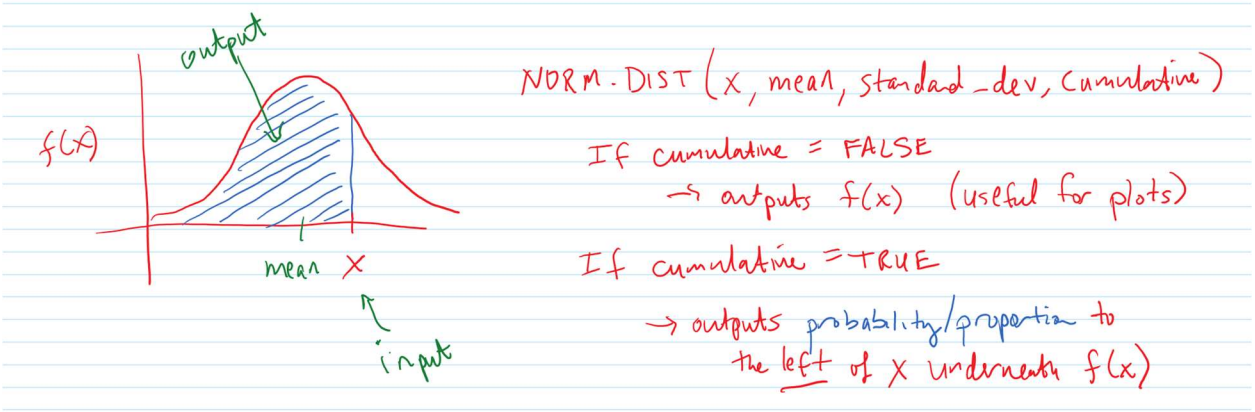
NOTE: The **.DIST** versions of each of the functions below will output probability as a function of percentage points (the "x-value", in other words) of the distribution. The **.INV** versions will output the x-value corresponding to probability.

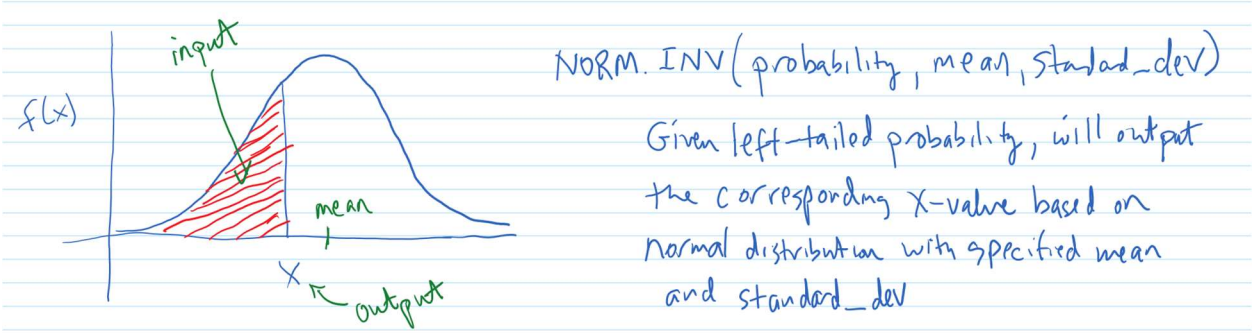
NORMAL DISTRIBUTION

NORM.DIST(x,mean,standard_dev,cumulative) – Provides the cumulative frequency (left-tailed) (if **cumulative** is **TRUE**) corresponding to the normal distribution of mean **mean** and standard deviation **standard_dev** to the left of **x**. It is rare to use **FALSE** as the final argument unless you want to generate a plot of f(x) in Excel.



Example: The area of to the left of 5 beneath the normal distribution with mean 4 and standard deviation 3 is: **NORM.DIST(5,4,3,TRUE)** = 0.632

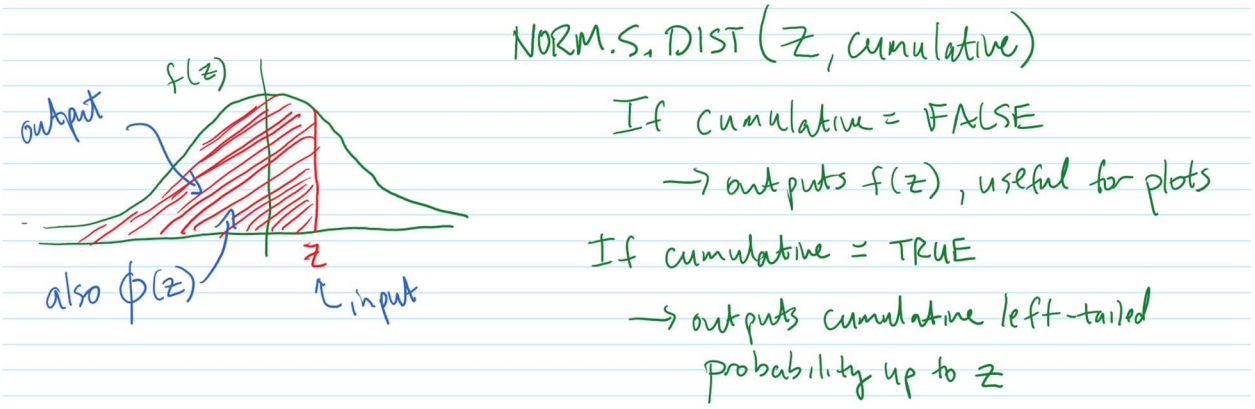
NORM.INV(probability,mean,standard_dev) – Outputs the x-value (percentage point) that has probability proportion to the left of it based on the normal distribution with mean **mean** and standard deviation **standard_dev**.



Example: The x-value corresponding to an area (probability) of 0.3 to the left of it based on a normal distribution with mean 4 and standard deviation 3 is**: =NORM.INV(0.3,4,3)** = 2.43

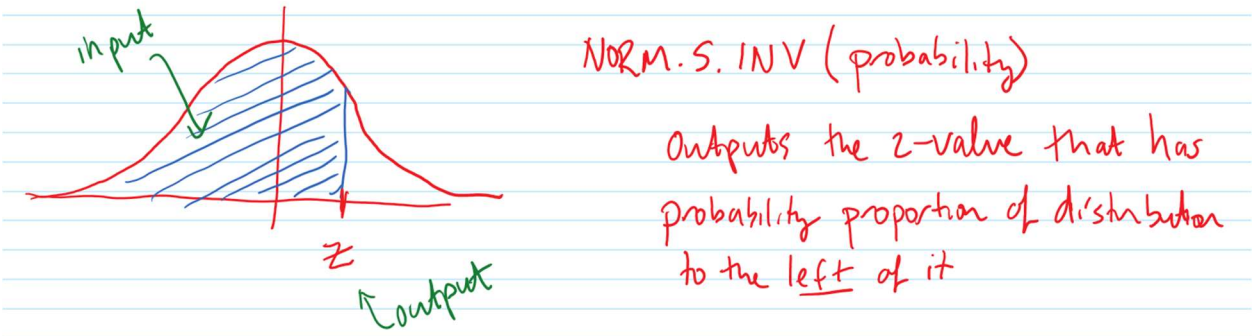
STANDARD NORMAL DISTRIBUTION

NORM.S.DIST(z,cumulative) – Outputs the cumulative frequency (left-tailed) (if **cumulative** = **TRUE**) corresponding to a z-value of **z** based on the standard normal distribution. If **cumulative** = **FALSE**, it outputs f(z), the probability density function. Note that this is the same as $\Phi(z)$ in the "Percentage Points of the Standard Normal Distribution" table .



Example: The area to the left of z = 0.7 of the standard normal distribution is given by: **=NORM.S.DIST(0.7,TRUE)** = 0.758

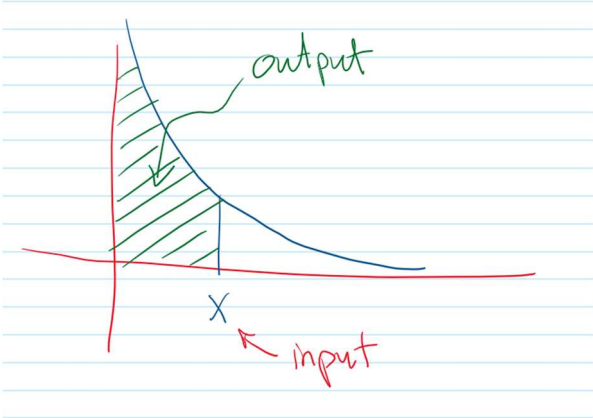
NORM.S.INV(probability) – Outputs the z-value (percentage point) with **probability** proportion to the left of it (left-tailed) based on the standard normal distribution. Note that the output of this function is the same as $\Phi^{-1}(P)$, where P is probability. In other words, the z-value corresponding to P proportion of the distribution to the left of it.



Example: The z-value that has 80% of the distribution to the left of it is: **=NORM.S.INV(0.8)** = 0.842

EXPONENTIAL DISTRIBUTION

EXPON.DIST(x,lambda,cumulative) – Outputs the left-tailed, cumulative probability [F(x)] of the exponential distribution up to **x** (if **cumulative** = **TRUE**) based on **lambda** for a Poisson process. If **cumulative** = **FALSE**, it outputs f(x), the probability density function.



Example: The area to the left of x = 0.5 of the exponential distribution with $\lambda = 3$ is:

=EXPON.DIST(0.5,3,TRUE) = 0.777

There is no **.INV** version of the exponential distribution in Excel (i.e., there is no **EXPON.INV** function).

GAMMA, WEIBULL, BETA, AND DISTRIBUTIONS

When used in the **.DIST** forms (e.g., **GAMMA.DIST**, **WEIBULL.DIST**, **BETA.DIST**), these functions in Excel output the left-tailed cumulative probability (if **cumulative** = **TRUE**) of the respective distributions up to a value of **x**. If **cumulative** = **FALSE**, these functions output the distribution function, f(x).

There are **.INV** versions of the gamma and beta distribution functions in Excel (i.e**., GAMMA.INV** and **BETA.INV**). These functions take cumulative probability and output the x value of the respective distribution (from the left). There is no **WEIBULL.INV** function.