Section 4.3: The Normal Probability Distribution

Wednesday, June 03, 2015
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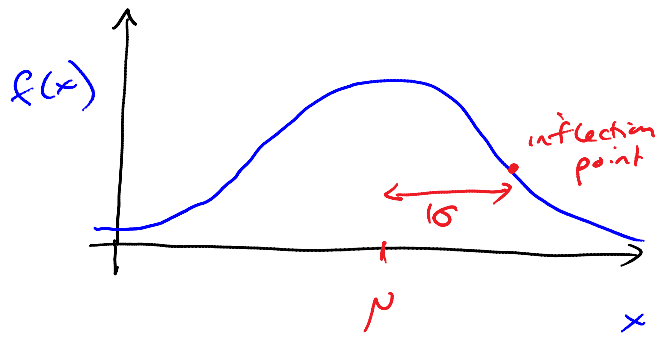
- mound-shaped distributions occur very frequently



mean μ
std dev σ

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

to find the probability that x lies between points a and b, can either

① integrate – but standard techniques fail here!
have to use numerical methods (Simpson's Rule)

② look it up a table of values

problem! you'd need an infinite number of tables, one for each combination of μ and σ

solution! standardize it

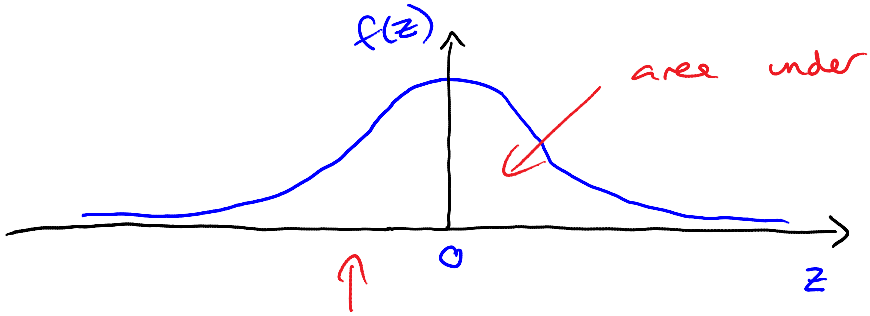
Z-score

$$z = \frac{x-\mu}{\sigma}$$

where z is the number of standard deviations

from the mean that X is

standard normal distribution:



area under the entire curve = 1

area under left-hand side of curve : ½

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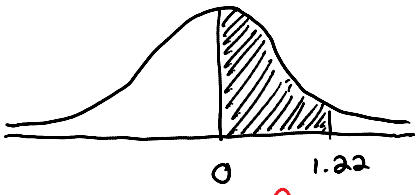
examples of using the standard normal table:



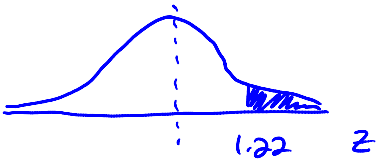
what is the probability of having a Z-score between 0 and 1.22?

area is 0.3888 from table

z	0.02
1.2	0.3888

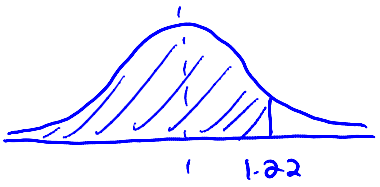
$P(0 < z < 1.22) = 0.3888$
$= 39\%$

what, then, is $P(z > 1.22)$?



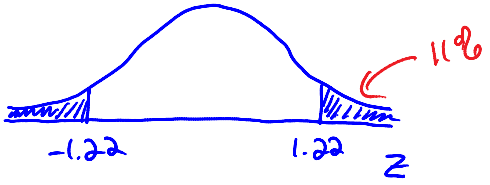
$P(z > 1.22) = 0.5 - 0.3888$
$= 0.1112$
$= 11\%$

and $P(z < 1.22)$?



$P(z < 1.22) = 0.5 + 0.3888$
$= 0.8888$
$\doteq 89\%$

and $P(|z| > 1.22)$?



$P(|z| > 1.22) = 22\%$

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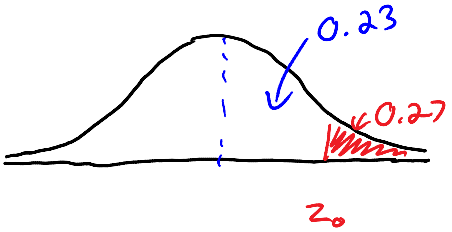
find z_0 if $P(z > z_0) = 0.27$



	0.01	0.02
0.6	0.2291 (closest)	0.2324

$z_0 = 0.61$