Section 5.2: cont'd

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1:44 PM

the central limit theorem talks about "when the sample size is large":

- if the sampled population has a normal distribution then $\bar{x}$ will also be normally distributed no matter how big or small n (sample size) is

- if the sampled population has a roughly symmetrical distribution, then $\bar{x}$ becomes approximately normal for relatively small values of n

  $\bar{x}$ <u>may</u> be normal for $n \geq 5$

- if sampled population is skewed, need at least 30 samples before their means/sums become approximately normally distributed

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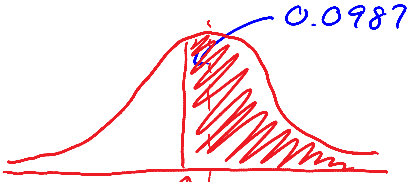
example: The dean of admissions in a large university has determined that the scores of the first-year class on a math test are normally distributed with a mean of 82 and a std dev of 8.

a) what is the probability that <u>any one</u> student drawn at random from the class has a score of at least 80?

b) what is the probability that the mean score of a random sample of 64 students is at least 80?

a)



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

$$= \frac{80-82}{8} = -0.25$$

$$\sigma$$

$$= \frac{80-82}{8} = -0.25$$

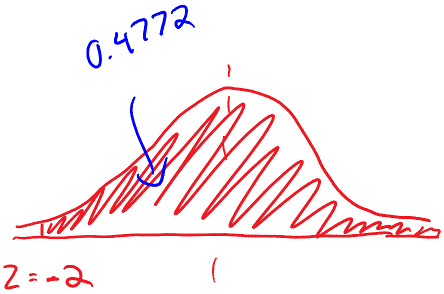
$$P(z > -0.25) = 0.5 + 0.0987$$

$$= 0.5987$$

$$= 59.9\% \text{ or } 60\%$$

b) now we are interested not in x but $\bar{x}$ and $\bar{x}$ has a std dev of $\sigma/\sqrt{n}$

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$



$$= \frac{80-82}{8/\sqrt{64}}$$

$$= -2$$

$$P(z > -2) = 0.5 + 0.4772$$

$$= 0.9772$$

$$= 97.7\% \text{ or } 98\%$$