Name:________________________

Notesheet. Section 10.3: Normal Distributions

Math 1220

Definition 1. The general normal probability density function with mean μ and standard deviation σ is defined to be

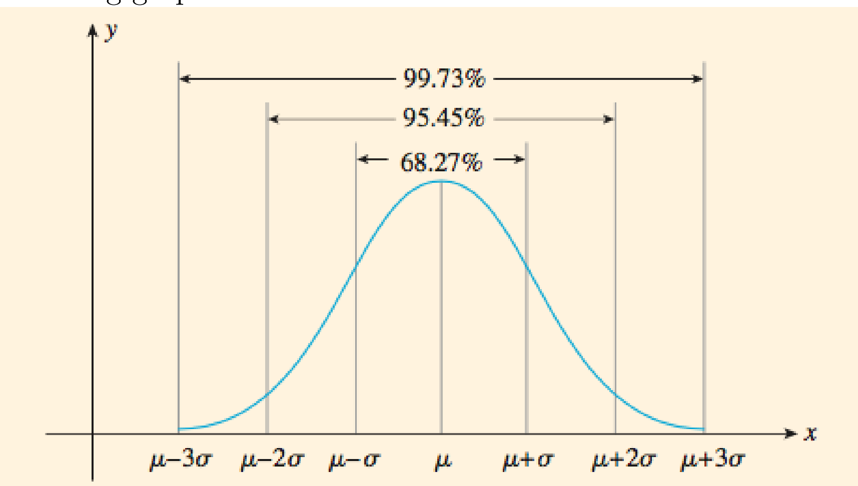
$$f(x) =$$

A normal variable is a RV X with PDF given by a normal probability density function.
Note, the standard normal distribution is the normal probability density function with $\mu = 0$ and $\sigma = 1$, thus giving simpler equation

$$f(x) =$$

The standard normal variable is the RV Z with PDF given by the standard normal distribution.

Theorem 2. The graph of a normal distribution is called a normal curve, which looks like the following graph:



Remark 3. *Since the integrals associated to the normal distribution are difficult to compute by hand, traditionally one would consult a table, often called a Z table. A small part of the Z table is here:*

z	0.00	0.01	0.02	0.03
0.0	0.5000	0.5040	0.5080	0.5120
0.1	0.5398	0.5438	0.5478	0.5517
0.2	0.5793	0.5832	0.5871	0.5910
0.3	0.6179	0.6217	0.6255	0.6293
0.4	0.6554	0.6591	0.6628	0.6664

You can find a copy of the Z table on the internet or Appendix C of the textbook.

Challenge 4. Using the Z table above, find $P(Z \leq 0.23), P(0 < Z < 0.23)$, and $P(Z > 0.23)$. Also, using the Z table above, find a number m such that $P(Z \leq m) = 0.5517$.

Theorem 5. Given a normal variable X with mean μ and standard deviation σ, then

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

and so

$$P(X < b) =$$

Challenge 6. If X is a normal variable with mean 10 and standard deviation 3, find the value of m such that $P(X < m) = 0.591$.

Challenge 7. Assume that

- The weights of M&M's are normally distributed with mean 9 grams and standard deviation 1 gram.
- The weights of Skittles are normally distributed with mean 10 gram and standard deviation 2 grams.

What is more likely?

(a) A randomly chosen M&M weights $>$ 10 grams.

(b) A randomly chosen Skittle weights $>$ 10 grams.