MAT 110 Formula Sheet

The Fundamental Principle of Counting

If k operations are performed in order, with possible number of outcomes $N_1, N_2, \ldots, N_k$, then there are

$$N_1 \cdot N_2 \cdots N_k$$

possible combined outcomes of the operations performed in the given order.

Probability Rules

Let A and B be events in a sample space S.

- ***Addition Rule:***

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

- ***Complimentary Rule:*** $P\left(\bar{A}\right) = 1 - P(A)$
- ***Conditional Probability:*** $P(A|B) = \dfrac{P(A \cap B)}{P(B)}$
- ***Bayes' Theorem:*** $P(A|B) = \dfrac{P(B|A)P(A)}{P(B)}$
- ***Product Rule:***

$$P(A \cap B) = P(A)P(B|A) = P(B)P(A|B)$$

z Scores

The z-score for an observation x in a normal distribution with mean μ and standard deviation σ is

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

Confidence Intervals

If a simple random sample of size n is drawn from a normal population with unknown mean μ and known standard deviation σ, then a level C confidence interval for μ is

$$\overline{x} \pm z^* \frac{\sigma}{\sqrt{n}}$$

where z^* is the critical value for a level C confidence interval. The margin of error for the confidence interval is the term

$$m = z^* \frac{\sigma}{\sqrt{n}}$$

Properties of Logarithmic Functions

For $a > 0$, $a \neq 1$, $M, N > 0$ and p a real number,

$$\ln M^p = p \ln M$$

Simple Interest

- The simple interest I on P dollars at an annual interest rate r for t years is

$$I = Prt.$$

- The final amount A of P dollars at an annual simple interest rate r for t years is

$$A = P + Prt = P(1 + rt).$$

Compound Interest

- The final amount A of P dollars at an annual interest rate r compounded m times per year for t years is

$$A = P\left(1 + \frac{r}{m}\right)^{mt}.$$

- The final amount A of P dollars at an annual interest rate r compounded continuously for t years is

$$A = Pe^{rt}.$$

Annuities

For an ordinary annuity with a regular payment of R dollars m times a year for t years at an annual interest rate r compounded at the end of each pay period the future value of the annuity is

$$A = R\left[\frac{\left(1 + \frac{r}{m}\right)^{mt} - 1}{\frac{r}{m}}\right].$$

Amortized Loans

An amortized loan of P dollars with regular payment of R dollars m times a year for t years at an annual interest rate r compounded at the end of each pay period satisfies the equation

$$P = R\left[\frac{1 - \left(1 + \frac{r}{m}\right)^{-mt}}{\frac{r}{m}}\right].$$