CSE 373 19 SP Midterm Mathematical Identities

Log of a product

$$\log_b(x \cdot y) = \log_b(x) + \log_b(y)$$

Log of a faction

$$\log_b\left(\frac{x}{y}\right) = \log_b(x) - \log_b(y)$$

Log of a power

$$\log_b(x^y) = y \cdot \log_b(x)$$

Power of a log

$$x^{\log_b(y)} = y^{\log_b(x)}$$

Change of base

$$\log_b(x) = \frac{\log_d(x)}{\log_d(b)}$$

Power Rules

$$(a^b)^c = a^{(b * c)}$$

$$a^b * a^c = a^{(b+c)}$$

Master Theorem

$$T(n) = \begin{cases} \text{d when n } = 1 \\ aT\left(\frac{n}{b}\right) + n\text{^}c \end{cases}$$

If $\log_b a < c$ then T(n) $\in \Theta(n^c)$

If $\log_b a = c$ then T(n) $\in \Theta(n^c \log n)$

If $\log_b a > c$ then T(n) $\in \Theta(n^{\log_b a})$

Splitting a sum

$$\sum_{i=a}^{b}(x + y) = \sum_{i=a}^{b} x + \sum_{i=a}^{b} y$$

Adjusting summation bounds

$$\sum_{i=a}^{b} f(x) = \sum_{i=0}^{b} f(x) - \sum_{i=0}^{a-1} f(x)$$

Factoring out a constant

$$\sum_{i=a}^{b} cf(i) = c\sum_{i=a}^{b} f(i)$$

Summation of a constant

$$\sum_{i=o}^{n-1} c = cn$$

Sum of squares

$$\sum_{i=o}^{n-1} i^2 = \frac{n(n-1)(2n-1)}{6}$$

Gauss's identity

$$\sum_{i=o}^{n-1} i = \frac{n(n-1)}{2}$$

Finite geometric series

$$\sum_{i=o}^{n-1} x^i = \frac{x^n - 1}{x - 1}$$