A.2 - Holiday Homework

$\sum_{k=0}^{\lg n} \lceil n/2^k \rceil$ upper bound: $O(n)$

$\sum_{k=0}$

$s = \frac{d}{t}$

avg $\quad t$

$d = s \times t$

A.1.1. $\sum_{k=1}^{n} \cancel{\theta}(f_k(i)) = O\left(\sum_{k=1} f_k(i)\right)$

$\sum_{k=1}^{n} g_k(i) \leq \sum_{k=1}^{n} c_k f_k(i)$

$\sum_{k=1}^{n} g_k(i) \leq c_k \sum_{k=1}^{n} f_k(i)$

A.1.2. $\sum_{k=1}^{n} (2k-1)$

$= 1 + 3 + 5 \ldots 2n - 1$

$1 + 3 \ldots + \underbrace{2(n-1) - 1}_{2n-3} + 2n - 1$

$2n$

$2n \times \frac{n}{2} = \boxed{n^2}$

A.1.3. $= \sum_{k=0}^{8} 10^k$

$\Rightarrow \frac{10^9 - 1}{9}$

A.1.5. $\sum_{k=1}^{n} k^c$ $\quad \theta(n^{c+1})$ implies $0 \leq c_1 n^{c+1} \leq \sum_{k=1}^{n} k^c \leq c_2 n^{c+1}$

$\sum_{k=1}^{n} k^c = 1^c + 2^c \ldots + (n-1)^c + n^c$

$\leq n \times n^c$

$\sum_{k=1}^{n} k^c \leq n^{c+1}$

$\sum_{k=1}^{n} k^c \geq \sum_{k=\frac{n}{2}}^{n} \left(\frac{n}{2}\right)^c + \left(\frac{n+2}{2}\right)^c \ldots + n^c$ * Still big θ

$\therefore \Omega$ of n^{c+1} $\quad \therefore \Theta(n^{c+1})$

A.2-1 $\sum_{k=1}^{n} \frac{1}{k^2}$

$= 1 + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} \ldots + \frac{1}{k^2}$

horizontal asymptote. $\leq \cancel{\frac{n}{1} + \frac{n}{4} + \frac{n}{9} \ldots \frac{1}{k}}$

$\cancel{\sum_{k=1}^{\infty} \frac{1}{k^2}}$ $\quad \cancel{\sum \frac{n}{k^2}} \leq \sum_{k=1}^{n} 1$

$\boxed{= n}$