Holiday Homework → summations 25.01

A.1 - 1 as $\sum_{k=1}^{n}(ca_k + b_k) = c\sum_{k=1}^{n} a_k + \sum_{k=1}^{n} b_k$ → $a_k = f_k(i)$, $b = 0$, $c = 0$

∴ $\sum_{k=1}^{n} O(f_k(i)) = O\sum_{k=1}^{n} f_k(i)$

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

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

$2n - 1 + 1 + 2(n-1) + 3 - 1$

$\cancel{\sum_{k=1}^{n}(bk+a) = \Theta(n^2)}$

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

$\sum_{k=0}^{9} 10^k = \frac{10^9 - 1}{9} = 111,111,111$

A.1 - 3 when the flip is interpreting a decimal in light of equation.

A.1 → 4 $\cancel{\sum_{k=1}^{\infty} \frac{(-1)^{k+1}}{2^k} = \frac{1}{3}}$ $\sum_{k=0}^{\infty} \frac{-1^k}{2^k} = \frac{2}{3}$

0 1 2

$1 - \frac{1}{2} + \frac{1}{4}$

A.1 → 5 ?

A.1 → 6. if $|x| < 1$ → $\sum_{k=0}^{\infty} x^k = \frac{1}{1-x}$, $\sum_{k=0}^{n} k^2 = \frac{(n+1)(n+2)n}{6}$

$\frac{d}{dx}\sum_{k=0}^{\infty} x^k \times x = \sum_{k=0}^{\infty} kx^k$ $\frac{d}{dx}\left(\frac{d}{dx}\left(\frac{1}{1-x}\right)\right)$

$\frac{d}{dx}\sum_{k=0}^{\infty} kx^k \times x = \sum_{k=0}^{\infty} k^2 x^k = \boxed{\frac{-x(x+1)}{(x-1)^3}}$

A.1 → 7 I don't know theta notation but I might come back to it.

$x =$

A.1 → 8. sum everything → $\sum_{k=1}^{n} k^c = \cancel{nkc}$

$\sum_{k=1}^{5} k = 1 + 2 + 3 + 4 + 5$

$= 1^c + 2^c + 3^c \ldots + n^c$

$\sum_{k=1}^{5} 2 = 1 + 1 + 1 + 1 + 1$

highest deg of $n = c$

Sum =

$\therefore = \Theta(n^c)$

Arithmetic series: $(n-c)^k = \Theta(n^k)$ $n^c \times n = n^{c+1}$

~~1st~~ $\cancel{k} = (\,)^c$ avg $= cn^k$ at const terms.