Assignment#1 Question#12 Andrew Plum

Wednesday, September 20, 2023 2:00 AM

$$12)\ \sum_{i=1}^{n}\left[(i+2)\,2^{i-1}\right]=\sum_{i=1}^{n}\left[(i+2)\frac{2^i}{2^1}\right]=\frac{1}{2}\sum_{i=1}^{n}(i2^i+2^{i+1})=$$

$$=\frac{1}{2}\sum_{i=1}^{n}(i2^i)+\frac{1}{2}\sum_{i=1}^{n}\left[(2)(2^i)\right]=\frac{1}{2}\sum_{i=1}^{n}(i2^i)+\sum_{i=1}^{n}(2^i)\approx$$

$$\frac{1}{2}\sum_{i=1}^{n}(i2^i)=\frac{1}{2}\left[(n-1)2^{n+1}+2\right]=2^n(n-1)+2\approx\Theta(n2^n)$$

$$\sum_{i=1}^{n}(2^i)\approx\frac{2^{n+1}-1}{2-1}=2^{n+1}-1\approx\Theta(2^n)$$

$$\approx\Theta(n2^n)+\Theta(2^n)\approx\boxed{\Theta(n2^n)}$$