2.

- 문제 2: $T(n) = T(n-1) + n$

$$
\begin{aligned}
T(n) &= T(n-1)+n \\
&= T(n-2)+n+(n-1) \\
&= T(n-3)+n+(n-1)+(n-2) \\
\cdots \\
&= T(n-n)+n+(n-1)+(n-2)+\cdots+1 \\
&= \frac{n(n+1)}{2}+1
\end{aligned}
$$

n이 n개만큼 반복되므로 Big-O notation으로는 $O(n^2)$이다.

4.

- 문제 4: $T(n) = T\left(\dfrac{n}{2}\right) + 1$

$$
\begin{aligned}
T(n) &= T\left(\frac{n}{2^1}\right)+1 \\
&= T\left(\frac{n}{2^2}\right)+1+1 \\
&= T\left(\frac{n}{2^3}\right)+1+1+1 \\
\cdots \\
&= T\left(\frac{n}{2^k}\right)+k \\
&= T(1)+\log_2(n)
\end{aligned}
$$

Big-O notation으로는 $O(\log n)$이다.

6.

$$T(n) = 2T\left(\frac{n}{2^1}\right) + n$$

$$= 2\left(2T\left(\frac{n}{2^2}\right) + \frac{n}{2}\right) + n = 2^2 T\left(\frac{n}{2^2}\right) + 2n$$

$$\cdots$$

$$= 2^k T\left(\frac{n}{2^k}\right) + kn$$

$$= nT(1) + n\log n$$

Big-O notation으로는 $O(n\log n)$이다.

8.

$$T(n) = T(n-1) + \frac{1}{n}$$

$$= T(n-2) + \frac{1}{n} + \frac{1}{n-1}$$

$$\cdots$$

$$= T(1) + \frac{1}{n} + \frac{1}{n-1} + \cdots + \frac{1}{n-(n-1)} = T(1) + \sum_{k=1}^{n}\frac{1}{k} < T(1) + \int_{1}^{n}\frac{1}{k}dk = T(1) + \log n$$

Big-O notation으로는 $O(\log n)$이다.