Problem 5

First, we rewrite the given formula on the format of the Master formula:

$$T(n) = \begin{cases} 1, & when\, n = 1 \\ T\left(\frac{n}{2}\right) + n, & n > 1 \end{cases}$$

By comparison to the general form of the master formula, we find that:

$$a = 1, b = 2, c = 1, k = 1$$

$$\therefore a = 1 < b^k = 2^1 = 2$$

$$\therefore T(n)\ is\ \Theta(n)$$