Q13→

$$T(n) = \begin{cases} T(n-3)+4 & n \geq 2 \\ 7 & n < 2 \end{cases}$$

$$T(n) = T(n-3)+4$$
$$= T(n-6)+4+4 = T(n-6)+8$$
$$= T(n-9)+4+4+4 = T(n-9)+12$$
$$\vdots$$
$$= T(n-3k)+4k$$

Sanity check with $k=3$
$T(n-3(3)+4(3)=12$ ✓

the recursion terminates at $n-3k=1$.

$$n-3k=1$$
$$\frac{-3k=1-n}{-1}$$

$$\frac{3k=-1+n}{3}$$

$$k=\frac{-1+n}{3}$$ ← number of unrollings to get to base case

at which point $T(n-3k)=7$. Thus,

$$T\left(n-3\left(\frac{-1+n}{3}\right)\right)+4\left(\frac{-1+n}{3}\right)$$
$$= T(1) + \left(\frac{-4+4n}{3}\right)$$
$$= T(1) + \frac{(-4)+4n}{3}$$
$$= 7 + \left(-\frac{4}{3}\right) + \frac{4}{3}n$$

Therefore, for $n \geq 2$, this is bounded above and below by products of constants with n (Example ⇒ 2 and 1). So

$$\boxed{T(n) \text{ is } \Theta(n)}$$