1.

(a) $9n + 77 = O(n),\ C < 50$

$T(n) \leq 86n,\ n \geq 1$

$T(n) \leq 43n,\ n \geq 2$

$C = 43,\ k = 2$

(b) $10n^2 + 80 = O(n^2),\ C < 40$

$T(n^2) \leq 90n^2,\ n \geq 1$

$T(n^2) \leq 45n^2,\ n \geq 2$

$T(n^2) \leq 30n^2,\ n \geq 3$

$T(n^2) \leq 18n^2,\ n \geq 5$

$T(n^2) \leq 15n^2,\ n \geq 6$

$T(n^2) \leq 10n^2,\ n \geq 9$

$C = 10,\ k = 9$

(c) $7n^2 + 200n = O(n^2),\ C < 100$

$T(n^2) \leq 207n^2,\ n \geq 1$

$T(n^2) \leq 69n^2,\ n \geq 3$

$T(n^2) \leq 23n^2,\ n \geq 9$

$C = 69,\ k = 3$

(d) $11n^2 + 75n + 84 = O(n^2),\ C < 40$

$T(n^2) \leq 170n^2,\ n \geq 1$

$T(n^2) \leq 85n^2,\ n \geq 2$

$T(n^2) \leq 34n^2,\ n \geq 5$

$T(n^2) \leq 17n^2,\ n \geq 10$

$C = 34,\ k = 5$

2.

(a)

$$T(n): 1+3+5+...+2n-1=n^2,\ n\geq 1$$
$$T(n+1): 1+3+5+...+2n-1+2(n+1)-1=(n+1)^2,\ n\geq 1$$
$$1+3+5+...+2n-1+2n+1=n^2+2n+1$$
$$T(n)+2n+1=n^2+2n+1$$
$$T(n)=n^2$$

(b)

$$T(n): 1\cdot 2^0+2\cdot 2^1+3\cdot 2^2+...+n\cdot 2^{n-1}=(n-1)\cdot 2^n+1,\ n\geq 1$$
$$T(n+1): 1\cdot 2^0+2\cdot 2^1+3\cdot 2^2+...+n\cdot 2^{n-1}+(n+1)\cdot 2^{n+1}-1=((n+1)-1)\cdot 2^n+1-1$$
$$1\cdot 2^0+2\cdot 2^1+3\cdot 2^2+...+n\cdot 2^{n-1}+(n+1)\cdot 2^n=n\cdot 2^{n+1}+1$$
$$1\cdot 2^0+2\cdot 2^1+3\cdot 2^2+...+n\cdot 2^{n-1}+2^n\cdot n+2^n=n\cdot 2^{n+1}+1$$
$$T(n)+2^n\cdot n+2^n=2^{n+1}\cdot n+1$$
$$T(n)=2^{n+1}\cdot n-2^n\cdot n-2^n+1$$
$$T(n)=2^n(2n-n-1)+1$$
$$T(n)=2^n(n-1)+1$$
$$T(n)=(n-1)\cdot 2^n+1$$