Exercise 4.5-1 Solutions

Note in all cases the "Divide" portion of the recurrence is $2T(n/4)$. Thus $a=2$, $b=4$ and $\log_4 2 = 1/2$

a. $T(n) = 2T(n/4) + 1$

$f(n) = n^0 \quad n^0 = O(n^{1/2-\epsilon})$ Case 1

$T(n) = \Theta(\sqrt{n}) \quad (\sqrt{n} = n^{1/2})$

b. $T(n) = 2T(n/4) + \sqrt{n}$

$f(n) = n^{1/2} \quad f(n) = \Theta(n^{1/2})$ Case 2

$T(n) = \Theta(\sqrt{n} \lg n)$

c. $T(n) = 2T(n/4) + n$

$f(n) = n^1 \quad f(n) = \Omega(n^{1/2+\epsilon})$ case 3

Regularity holds ($f(n) = n^k \ (k=1)$)

$T(n) = \Theta(n)$

d. $T(n) = 2T(n/4) + n^2$

Similar to c. $T(n) = \Theta(n^2)$

case 3