# Master Method Solutions

## 4. T(n) = 2T(n/4) + 1

* T(n) = aT(n/b) + f(n)
* a = 2, b = 4, f(n) = 1 = n⁰, d = 0
* n^log\_b(a) = n^log₄(2) = n^0.5
* Compare: f(n) = n⁰ < n^0.5 ⇒ Case 1
* T(n) = O(n^log₄(2)) = O(n^0.5)
* Class: Polynomial

## 5. T(n) = 2T(n/4) + √n

* T(n) = aT(n/b) + f(n)
* a = 2, b = 4, f(n) = n^0.5, d = 0.5
* n^log\_b(a) = n^log₄(2) = n^0.5
* Compare: f(n) = n^0.5 = n^log₄(2) ⇒ Case 2
* T(n) = O(n^0.5 log n)
* Class: Quasi-polynomial

## 6. T(n) = 2T(n/4) + n²

* T(n) = aT(n/b) + f(n)
* a = 2, b = 4, f(n) = n², d = 2
* n^log\_b(a) = n^log₄(2) = n^0.5
* Compare: f(n) = n² > n^0.5 ⇒ Case 3 (regularity condition met)
* T(n) = O(n²)
* Class: Polynomial

## 7. T(n) = 10T(n/3) + n²

* T(n) = aT(n/b) + f(n)
* a = 10, b = 3, f(n) = n², d = 2
* n^log\_b(a) = n^log₃(10) ≈ n^2.10
* Compare: f(n) = n² < n^2.10 ⇒ Case 1
* T(n) = O(n^2.10)
* Class: Polynomial

## 8. T(n) = 2T(2n/3) + 1

* Rewrite: T(n) = 2T(n / (3/2)) + 1
* T(n) = aT(n/b) + f(n)
* a = 2, b = 3/2, f(n) = 1 = n⁰, d = 0
* n^log\_b(a) = n^log\_{3/2}(2) ≈ n^1.71
* Compare: f(n) = n⁰ < n^1.71 ⇒ Case 1
* T(n) = O(n^1.71)
* Class: Polynomial