CS 325 – Master Method Practice Problems

1. $T(n) = 3T(n/2) + n^2$

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

3. $T(n) = T(n/2) + 2^n$

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

5. $T(n) = 16T(n/4) + n$

6. $T(n) = 2T(n/4) + n^{0.51}$

7. $T(n) = 0.5T(n/2) + 1/n$

8. $T(n) = \sqrt{2}T(n/2) + \log n$

9. $T(n) = 3T(n/4) + n \log n$

10. $T(n) = 3T(n/3) + n/2$

11. $T(n) = 64T(n/8) - n^2\log n$

Solutions:

1. $T(n) = 3T(n/2) + n^2$

   $T(n) = \Theta(n^2)$ (Case 3)

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

   $T(n) = \Theta(n^2 \log n)$ (Case 2)

3. $T(n) = T(n/2) + 2^n$

   $T(n) = \Theta(2^n)$ (Case 3)

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

   Does not apply (a is not constant)

5. $T(n) = 16T(n/4) + n$

   $T(n) = \Theta(n^2)$ (Case 1)

6. $T(n) = 2T(n/4) + n^{0.51}$

   $T(n) = \Theta(n^{0.51})$ (Case 3)

7. $T(n) = 0.5T(n/2) + 1/n$

   Does not apply ($a < 1$)

8. $T(n) = \sqrt{2}T(n/2) + \log n$

   $T(n) = \Theta(\sqrt{n})$ (Case 1)

9. $T(n) = 3T(n/4) + n \log n$

   $T(n) = \Theta(n \log n)$ (Case 3)

10. $T(n) = 3T(n/3) + n/2$

    $T(n) = \Theta(n \log n)$ (Case 2)

11. $T(n) = 64T(n/8) - n^2 \log n$

    Does not apply (f(n) is not positive)