Problem 1-1. $T(n) = 3T(n/2) + n^2$
$T(n) \doteq \Theta(n^2)$ (case 3).

Problem 1-2. $T(n) = 7T(n/2) + n^2$
$T(n) = \Theta(n^{\lg 7})$ (case 1).

Problem 1-3. $T(n) = 4T(n/2) + n^2$
$T(n) = \Theta(n^2 \lg n)$ (case 2).

Problem 1-4. $T(n) = 3T(n/4) + n \lg n$
$T(n) = \Theta(n \lg n)$ (case 3).

Problem 1-5. $T(n) = 4T(n/2) + \lg n$
$T(n) = \Theta(n^2)$ (case 1).

Problem 1-6. $T(n) = T(n-1) + n$
M.T. doesn't apply. Iteration gives $T(n) = \Theta(n^2)$.

Problem 1-7. $T(n) = 4T(n/2) + n^2 \lg n$
$T(n) = \Theta(n^2 \lg^2 n)$ (extended case 2).

Problem 1-8. $T(n) = 5T(n/2) + n^2 \lg n$
$T(n) = \Theta(n^{\lg 5})$ (case 1).

Problem 1-9. $T(n) = 3T(n/3) + n/\lg n$
M.T. case 1 doesn't apply since $f(n) = n/\lg n$ is not polynomially smaller than $n^{\log_3 3-\varepsilon}$ for any $\varepsilon > 0$.

Problem 1-10. $T(n) = 2T(n/4) + c$
$T(n) = \Theta(n^{1/2})$ (case 1).

Problem 1-11. $T(n) = T(n/4) + \lg n$
$T(n) = \Theta(\lg^2 n)$ (extended case 2).

Problem 1-12. $T(n) = T(n/2) + T(n/4) + n^2$
M.T. doesn't apply. Recursion tree gives guess $T(n) = \Theta(n^2)$.

Problem 1-13. $T(n) = 2T(n/4) + \lg n$
$T(n) = \Theta(n^{1/2})$ (case 1).

Problem 1-14. $T(n) = 3T(n/3) + n\lg n$
$T(n) = \Theta(n\lg^2 n)$ (extended case 2).

Problem 1-15. $T(n) = 8T((n-\sqrt{n})/4) + n^2$
M.T. doesn't apply. Using Akra-Bazzi can ignore $\sqrt{n}/4$, which gives $\Theta(n^2)$. Could also use M.T. to get an upper bound of $O(n^2)$ by removing the $\sqrt{n}/4$ term and a lower bound of $\Omega(n^2)$ by replacing the $(n-\sqrt{n})/4$ term by $0.24n$.

Problem 1-16. $T(n) = 2T(n/4) + \sqrt{n}$
$T(n) = \Theta(n^{1/2}\lg n)$ (case 2).

Problem 1-17. $T(n) = 2T(n/4) + n^{0.51}$
$T(n) = \Theta(n^{0.51})$ (case 3).

Problem 1-18. $T(n) = 16T(n/4) + n!$
$T(n) = \Theta(n!)$ (case 3).

Problem 1-19. $T(n) = 3T(n/2) + n$
$T(n) = \Theta(n^{\lg 3})$ (case 1).

Problem 1-20. $T(n) = 4T(n/2) + cn$
$T(n) = \Theta(n^2)$ (case 1).

Problem 1-21. $T(n) = 3T(n/3) + n/2$
$T(n) = \Theta(n \lg n)$ (case 2).

Problem 1-22. $T(n) = 4T(n/2) + n/\lg n$
$T(n) = \Theta(n^2)$ (case 1).

Problem 1-23. $T(n) = 7T(n/3) + n^2$
$T(n) = \Theta(n^2)$ (case 3).

Problem 1-24. $T(n) = 8T(n/3) + 2^n$
$T(n) = \Theta(2^n)$ (case 3).

Problem 1-25. $T(n) = 16T(n/4) + n$
$T(n) = \Theta(n^2)$ (case 1).