1 Master Method

Solve the following recurrences with the Master Method, if possible. Be clear to show the value of the constants $a, b$. Also identify exactly which case you are using. If a logarithm can be easily simplified (such as $\log_2 4 = 2$), do so; if not (such as $\log_5 7$), you may either convert it to a decimal value, or keep it in logarithm form.

If the recurrence cannot be solved by the Master Method, state why.

(a) $T(n) = 4T\left(\frac{n}{2}\right) + n$

(b) $T(n) = 3T\left(\frac{n}{3}\right) + n^3$

(c) $T(n) = 2T\left(\frac{n}{4}\right) + \sqrt{n}$

(d) $T(n) = 4T\left(\frac{9n}{10}\right) + n^2$

(e) $T(n) = 4T\left(\frac{10n}{9}\right) + n^2$

(f) $T(n) = 2T\left(\frac{n}{2}\right) + n \log n$

(g) $T(n) = 7T\left(\frac{n}{8}\right) + n^2 \log n$

(h) $T(n) = 8T\left(\frac{n}{2}\right) + n^2 \log n$

(i) $T(n) = 2T\left(\frac{n}{2}\right) + \log n$