

log n
n
2)

$$\lim_{n \rightarrow \infty} \frac{f(n)}{g(n)} = \lim_{n \rightarrow \infty} \frac{gn}{5n^3} = \lim_{n \rightarrow \infty} \frac{g}{5n^2} = 0$$

$$\lim_{n \rightarrow \infty} \frac{f(n)}{g(n)} = \lim_{n \rightarrow \infty} \frac{5n^2}{gn} = \lim_{n \rightarrow \infty} \frac{5n^2}{g} = \infty$$

so ~~$f(n) \in o(g)$~~ ~~$f(n) \in \Omega(g)$~~ ~~$f(n) \in \Theta(g)$~~
 $f(n) \notin \Theta(g)$ $f \notin \Omega(g)$ $g \notin O(f)$ $g \notin \omega(f)$
 $f(n) \in O(g)$ $f \notin \omega(g)$ $g \notin \Theta(f)$ $g \in \Omega(f)$
 $f(n) \in o(g)$ $g \notin \Theta(f)$ $g \in \Omega(f)$

6) $f(n) = 9n^{0.8} + 2n^{0.5} + 14 \log n$ and $g(n) = \sqrt{n}$

$$\lim_{n \rightarrow \infty} \frac{f(n)}{g(n)} = \lim_{n \rightarrow \infty} \frac{9n^{0.8} + 2n^{0.5} + 14 \log n}{n^{0.5}} = \infty$$

smaller

$$\lim_{n \rightarrow \infty} \frac{g(n)}{f(n)} = \lim_{n \rightarrow \infty} \frac{n^{0.5}}{9n^{0.8} + 2n^{0.5} + 14 \log n} = 0$$

$f \notin \Theta(g)$	$g \notin \Theta(f)$
$f \notin O(g)$	$g \in O(f)$
$f \notin o(g)$	$g \in o(f)$
$f \notin \Omega(g)$	$g \notin \Omega(f)$
$f \notin \omega(g)$	$g \notin \omega(f)$

7) $f(n) = \frac{n^2}{\log n}$ $g(n) = n \log n$

$$\lim_{n \rightarrow \infty} \frac{f(n)}{g(n)} = \lim_{n \rightarrow \infty} \frac{\frac{n^2}{\log n}}{n \log n} = \lim_{n \rightarrow \infty} \frac{n^2}{n \log^2 n} = \infty$$

$$\lim_{n \rightarrow \infty} \frac{g(n)}{f(n)} = \lim_{n \rightarrow \infty} \frac{n \log n}{\frac{n^2}{\log n}} = \frac{n \log^2 n}{n^2} = 0$$

$$\begin{array}{cccccc}
 f \notin \Theta(g) & f \notin O(g) & f \notin o(g) & f \in \Omega(g) & f \in \omega(g) \\
 g \notin \Theta(f) & g \in O(f) & g \in o(f) & g \notin \Omega(f) & g \notin \omega(f)
 \end{array}$$

$$d) \quad f(n) = (\log(3n))^3 \quad \text{and} \quad g(n) = n \log(n)$$

$$\lim_{n \rightarrow \infty} \frac{f(n)}{g(n)} = \lim_{n \rightarrow \infty} \frac{\log^3(3n)}{n \log n} = 0$$

$$\lim_{n \rightarrow \infty} \frac{g(n)}{f(n)} = \lim_{n \rightarrow \infty} \frac{n \log n}{\log^3(3n)} = \infty$$

$$\begin{array}{cccccc}
 f \notin \Theta(g) & f \notin O(g) & f \notin o(g) & f \in \Omega(g) & f \in \omega(g) \\
 g \notin \Theta(f) & g \in O(f) & g \in o(f) & g \notin \Omega(f) & g \notin \omega(f)
 \end{array}$$