Assignment - 2

2)

1) $f(n) = n - 10$

$g(n) = n + 10$

$f(n) = \Theta(g(n))$

$f(n) = O(g(n))$

$f(n) = \Omega(g(n))$

Big O

$f(n) \leq c\, g(n)$

$n - 10 \leq c\, n + 10$

$c = 1$

$n - 10 \leq n + 10$ ✓

$f(n) = O(g(n))$ ✓

Θ

$f(n) = c\, g(n)$

$n - 10 = c\, n + 10$ ✗

$f(n) = \Theta(g(n))$ ✗

Ω

$f(n) \geq c\, g(n)$

$n - 10 \geq c\, n + 10$

$f(n) = \Omega(g(n))$ ✗

a) $f(n) = n$

$g(n) = n$

$f(n) = \Theta(g(n))$

$f(n) = O(g(n))$

$f(n) = \Omega(g(n))$

Big O

$f(n) \leq c\,g(n)$

$n \leq cn$

$c = 1$

$n \leq n$ ✓

$f(n) = O(g(n))$ ✓

Ω

$f(n) \geq c\,g(n)$

$n \geq cn$

$c = 1$

$n \geq n$

$f(n) = \Omega(g(n))$ ✓

Θ

$f(n) = cg(n)$

$n = cn$

$c = 1$

$n = n$

$f(n) = \Theta(g(n))$ ✓

3) $64^{\log_2 n} \quad 32^{\log_2 n} = O(n^5)$

$n^{\log_2 64} \quad n^{\log_2 32} \leq c\, n^5$

$n^6 \, n^5 \leq c\, n^5$

$c = 1$

$n^{11} \leq n^5 \times \quad f(n) \leq c\, g(n) \times$

(2)

$f(n) \geq c\, g(n)$

$n^{11} \geq c\, n^5$

$c = 1$

$n^{11} \geq n^5$ ✓

$f(n) = \Omega(g(n))$ ✓

(3)

$f(n) = c\, g(n)$

$n^{11} = c\, n^5$ ×

$f(n) = c\, g(n)$ ×

4) $\frac{4^n}{2^n} = O(2^n)$

$f(n) = O(g(n))$

$f(n) \leq c\,g(n)$

$\frac{2^n \cdot 2^n}{2^n} \leq c\,2^n$

$2^n \leq c\,2^n$

$c = 1$

$2^n \leq 2^n$ ✓

$f(n) = O(g(n))$ ✓

Ω

$f(n) \geq c\,g(n)$

$2^n \geq c\,2^n$

$c = 1$

$2^n \geq 2^n$

$f(n) \geq c\,g(n)$ ✓

Θ

$f(n) = c\,g(n)$

$2^n = c\,2^n$

$c = 1$

$2^n = 2^n$ ✓

$f(n) = c\,g(n)$ ✓

5) $128^{\log_2 n} n^2 = \Theta(n^9)$

$n^{\log_2 128} n^2 = \Theta(n^9)$

$n^7 n^2 = \Theta(n^9)$

$n^9 = \Theta(n^9)$

Big O

$f(n) \leq c\, g(n)$ ✓

$n^9 \leq c\, n^9$

$c = 1$

$n^9 \leq n^9$ ✓

Ω

$f(n) \geq c\, g(n)$

$n^9 \geq c\, n^9$

$c = 1$

$n^9 \geq n^9$ ✓

Θ

$n^9 \leq c\, n^9$

$c = 1$

$n^9 = n^9$

$f(n) = c\, g(n)$ ✓