

HW 2-3, 5, 6, 8, 14, 19, 20, 62

$$(5) (x^2+1)/(x+1) = O(x)$$

$$\frac{x^2+1}{x+1} = \frac{x^2}{x} = x$$

$$(6) (x^3+2x)/(2x+1) = O(x^2)$$

$$\frac{(x^3+2x)}{(2x+1)} = \frac{x^3}{2x} + \frac{2x}{2x} = \frac{1}{2}x^2 + 1 = O(x^2)$$

$$(8) D(x^n)$$

$$a) f(x) = \frac{2x^2 + x^3 \log x}{x^5 \log x} = \frac{x^3}{x^4} = x^{-1}$$

$$1) \frac{(x^3 + 5 \log x)}{x^4 - 1} = \frac{x^3}{x^4} + \frac{5 \log x}{x^4} = \frac{1}{x} + \frac{5 \log x}{x^4}$$

$$b) \frac{3x^5 + \log(x)^4}{x^5 \log(x)^4} = \frac{3}{\log(x)^4} + \frac{\log(x)^4}{x^5 \log(x)^4} = \frac{3}{\log(x)^4} + \frac{1}{x^5}$$

$$(14) a) \text{ False}$$

$$b) \text{ True}$$

$$c) \text{ True}$$

$$d) \text{ False}$$

$$e) \text{ False}$$

$$f) \text{ True}$$

$$c) \frac{(x^4 + 5x + 1)/(x^4 + 1)}{x^4 + x^2 + 1} = \frac{x^4 + 5x + 1}{(x^4 + 1)(x^4 + x^2 + 1)}$$

$$\frac{x^4}{x^4} + \frac{5x}{x^4} = x^{\frac{1}{2}}$$

(19) a) $(n^4 + 8)(n+1)$

$$n^3 + n^2 + 8n + 8$$

$$N^3 = \Theta(n)$$

b) $(n \log n + n^2)(n^3 + 2)$

$$n^4 \log n + 2n \log n + n^5 + 2n^2$$

$$n^4 \log n$$

c) $(n! + 2^n)(n^3 + \log(n^2 + 1))$

$$n!$$

(20) a) $(n^3 + n^2 \log n)(\log n + 1) + (\log_3 n + 19)(n^3 + 2)$

$$n^3 \log n$$

b) $(2^n + n^2)(n^5 + 3^n)$
 $\cdot 2^n \cdot 3^n$

c) $(n^n + n^2 + 5^n)(n! + 5^n)$

$$n! n^n$$

(62) $\log(n!) = O(n \log n)$

$$\log(n \cdot n+1 \cdot n+2 \cdot \dots \cdot n)$$

$$\log(n \cdot \infty)$$

$$\log(1) + \log(2) + \dots + \log(n)$$

$$n \log(n)$$