2. Determine whether each of these functions is O(x2).

a) f (x) = 17x + 11

O(x), 17x + 11 = C(x), k = 1, C = 28, O(x) therefore also O(x^2)

b) f (x) = x^2 + 1000

O(x^2), x^2 + 1000 = C(x^2) k = 10, C = 11

c) f (x) = x log x

O(x), x log x = C(x), k = 1, C = 2

d) f (x) = $x^4/2$

O(x^4) therefore not O(x^2)

e) f (x) = 2^x

O(2^x) therefore not O(x^2)

f) f (x) = $\lfloor x \rfloor . \lceil x \rceil$

floor(x) * ceil(x) <= x * (x+1) = x^2 + x = O(x^2), x^2 + x = C(x^2), k = 1, C = 2

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4. Use the definition of “f (x) is O(g(x))” to show that $2^x + 17$ is $O(3^x)$.

$2^x + 17 < 2^x + 2^x$ for x > 5

In summary, we found that $2^x + 17 < 2 * 3^x$ for all x > 5.
Hence, $2^x + 17$ is $O(3^x)$.

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8. Find the least integer n such that f (x) is O(xn) for each of these functions.

a) f (x) = $2x^2 + x^3 \log x$ → $O(x^4)$

b) f (x) = $3x^5 + (\log x)^4$ → $O(x^5)$

c) f (x) = $(x^4 + x^2 + 1)/(x^4 + 1)$ → O(1)

d) f (x) = $(x^3 + 5 \log x)/(x^4 + 1)$ → n=-1