

Theorem (3.2.7a). *Let f be the function defined by $2x^3 + x^2 \log x$. $f(x)$ is $\mathcal{O}(x^3)$.*

Proof. Let g be the function defined by $g(x) = x^3$. If $x \geq 1$, then

$$f(x) = 2x^3 + x^2 \log x \leq 2x^3 + x^3 = 3x^3.$$

Thus, $|f(x)| \leq 3|g(x)|$, for all $x > 1$. That is, $f(x)$ is $\mathcal{O}(x^3)$ with constant witnesses $C = 3$, and $k = 1$. ■