# Quiz 1 Reflection

3. ~~$f(n) \not\Rightarrow$~~

$f(n) = o\,g(n) \not\Rightarrow \ln f(n) \in o(\ln(g(n)))$

There exist a counter-example that $f(n) = n$ $g(n) = n^2$

$f(n) = o\,g(n)$ — obviously

$n = o(n^2)$

$\ln f(n) = \ln n$

$\ln(g(n)) = \ln n^2 = 2\ln n.$

Thus $\ln f(n) = \theta(g(n))$.

6. Compute the $\lim\limits_{n\to\infty} \frac{f(n)/g(n)}{h(n)}$, guess $h(n) = n$

$$\lim_{n\to\infty} \frac{f(n)/g(n)}{h(n)} = \lim_{n\to\infty} \frac{a_0 + a_1 n + \cdots + a_k n^k}{n^{k-1} \cdot n}$$

$$= \lim_{n\to\infty} \frac{a_0}{n^k} + \frac{a_1}{n^{k-1}} + \cdots a_k$$

$$= a_k.$$

Since $a_k > 0$, $\frac{f(n)}{g(n)} = \theta h(n)$

3: Since we've proved that $f(n) = \theta g(n) \Rightarrow \ln f(n) = \theta(\ln g(n))$, I thought it would similar to prove "o" case. But I forgot $o \neq \theta$.

6. I first compute $\lim\limits_{n\to\infty} \frac{f(n)}{g(n)}$, then using the result directly to compute $\lim\limits_{n\to\infty} \frac{f(n)/g(n)}{h(n)}$. But I forgot I've used $(k-1)$ times L'Hospital's theorem on first result. So. I get the final result wrong