TRUE (or) FALSE

Big – *O* Notation:

Let *f* and *g* be functions $f,g:N\to R^{+}$ say that $f(n)=O(g(n))$ if positive integers *c* and n_0 exist such that for every integer $n\geq n_0$

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

When $f(n)=O(g(n))$ we say that $g(n)$ is an upper bound for $f(n)$.

(a)

True.

The statement $2n=O(n)$ is valid, because from the definition of Big-*O* notation it is clear that $f(n)=c(g(n))$.

(b)

False.

The statement $n^2=O(n)$ is not valid, because $n^2=n\cdot n$ which will grow faster than *n*.

That contradicts Big – *O* notation. Thus, $n^2=O(n)$ is False.

(c)

False.

The statement $n^2=O(n\log^2 n)$ is not valid, because factor *n* grows faster than the factor $\log^2 n$. That means $f(n)>g(n)$, which contracts the Big –*O* notation.

Hence $n^2=O(n\log^2 n)$is false.

(d)

True.

The statement $n\log n=O(n^2)$ is valid, because the factor $\log n$ grows slower than the factor *n*. That means $f(n)<g(n)$.From Big-*O* notation $n\log n-O(n^2)$ is true.

(e)

True.

The statement $3^n=2^{O(n)}$ is valid, because $3^n=2^{n\log 3}$ and $n\log 3=O(n)$.

From Big-*O* notation $3^n=2^{O(n)}$ is true.

(f)

True.

The statement $2^{2^n}=O(2^{2^n})$ is valid, because from Big- *O* notation $f(n)=O(f(n))$ for any function $f(n)$. Hence $2^{2^n}=O(2^{2^n})$ is true.