1. Suppose \( f(x) \) and \( g(x) \) are functions for which we know \( f(x) = o(x^2) \) and \( g(x) = o(x^3) \) (as \( x \to 0 \)).

In the following true/false questions use the definition of little-o to either give a short proof why the statement is always true, or else find an example of functions \( f \) and \( g \) that shows that the statement is not always true.

- \( f(x) + g(x) = o(x^2) \): True or False?
  Reason:

- \( f(x) + g(x) = o(x^3) \): True or False?
  Reason:

- \( xf(x) + g(x) = o(x^3) \): True or False?
  Reason:
2. (a) Compute $T_4[f(x)]$ for $f(x) = e^{-x^2} \cos(2x)$ without computing any derivatives of $f(x)$.

(b) Using your answer to part (a), compute $f^{(4)}(0)$. 