

**PM – Calculus  
Assignment  
Distinguishing Between Product of Functions & Composite Functions**

$f(x)g(x)$  is a product of two functions:  $F_1 \times F_2$       where:  $F_1 = f(x)$      $F_2 = g(x)$

Note: i) Both  $f$  and  $g$  have a simple input of just  $x$ ! Both are functions of just  $x$ .

ii) It is read: “ $f(x)$  **times**  $g(x)$ ”

$f[g(x)]$  is a composition of two functions, i.e. “A function of another function.”

Note: i) The input to  $f$  is not just  $x$  - the input to  $f$  is another function,  $g$ . (The input to  $g$  can be just  $x$ ).

ii) It is read: “ $f$  **of**  $g(x)$ ”

iii)  $f$  is called the **Outside Function** and  $g$  is called the **Inside Function**.

**Examples**

- |                    |                                                           |                                |                    |
|--------------------|-----------------------------------------------------------|--------------------------------|--------------------|
| 1. $x^2 \cos(x)$   | Read it: “ $x^2$ <u>times</u> $\cos(x)$ ”                 | →                              | <b>Product</b>     |
|                    | $f$ and $g$ are both functions of just $x$                | →                              | <b>Product</b>     |
| 2. $\cos(x^2)$     | Read it: “Cosine <u>of</u> $x^2$ ”                        | →                              | <b>Composition</b> |
|                    | Outside function: $\cos( )$                               | Inside function: $x^2$         |                    |
| 3. $(2x^2 + 3x)^4$ | Read it: “4 <sup>th</sup> Power <u>of</u> $(2x^2 + 3x)$ ” | →                              | <b>Composition</b> |
|                    | Outside function: $( )^4$                                 | Inside function: $(2x^2 + 3x)$ |                    |
| 4. $e^{\sin x}$    | Read it: “ $e$ <u>of</u> $\sin x$ ”                       | →                              | <b>Composition</b> |
|                    | Outside function: $e^{( )}$                               | Inside function: $\sin x$      |                    |
| 5. $e^x \sin x$    | Read it: “( $e$ of $x$ ) <u>times</u> ( $\sin$ of $x$ )”  | →                              | <b>Product</b>     |
|                    | Both functions are functions of just $x$                  | →                              | <b>Product</b>     |

Determine if the following are a product or a composition of functions.

- i. If it is a product, state the two individual functions.
- ii. If it is a composition, state the outside and the inside function.

Function	Product or Composition?	Product		Composition	
		$F_1$	$F_2$	Outside Function	Inside Function
$e^x(x^3 - 1)$					
$(x^2 + 9)(2 - \ln x)$					
$(t + \sin t)^4$					
$\sin^5 x$					
$\cos(5n)$					
$5x(\tan x)$					
$\sqrt{11z + 4}$					
$\sin(\cos \theta)$					
$\sec\left(\frac{1}{x}\right)$					
$(\sqrt{x} + 1)(\sqrt{x} - 1)$					
$(4g + 9)^{\frac{1}{2}}$					
$e^{e^x}$					