

## Key Concepts

- Composite Functions

a function where you apply one function to another denoted as  $f \circ g(x) = f(g(x))$

- Chain Rule

Suppose we define  $F(x) = (f \circ g)(x)$  then the derivative will be

$$F'(x) = f'(g(x))g'(x)$$

- Let  $f(x) = \sin(x)$  and  $g(x) = x^4$ . Then if  $h(x) = (f \circ g)(x)$  then

$$h'(x) = (\sin(x^4))' = 4x^3 \cos(x^4)$$

## Practice Problems

1. Use the table to solve the following problems

x	1	2	3
f(x)	3	0	1
f'(x)	-3	5	-2
g(x)	4	-1	1
g'(x)	-4	3	0

a) If  $h(x) = g(f(x))$  then find  $h'(3)$

b) If  $j(x) = f(g(x))g(x)$  and  $j'(3)$

Differentiate the following functions

2.  $f(x) = 4 \sec^3(5x)$

3.  $g(x) = -\cos^2(x^2 + 2x - 3)$

4.  $h(x) = e^4 \cos^5(5x)$

5.  $j(z) = (3z^5 + \cos^4(x))^5 0$