

Concepts Worksheet 5

Chapter 2 For use after Article 2.4.

Differentiation

1. Given the following tabular information about differentiable functions $f(x)$ and $g(x)$ at $x = 2$ and $x = 3$,

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	8	2	$1/3$	-3
3	3	-4	2π	5

determine the value of:

_____ a) $\frac{d}{dx} \{2f(x)\}$ at $x = 2$

i) $\frac{d}{dx} f^{-1}(x)$ at $x = 8$

_____ b) $\frac{d}{dx} \{f(x) + g(x)\}$ at $x = 3$

_____ c) $\frac{d}{dx} \{f(x) \cdot g(x)\}$ at $x = 3$

_____ d) $\frac{d}{dx} \left\{ \frac{f(x)}{g(x)} \right\}$ at $x = 2$

_____ e) $\frac{d}{dx} \{f(g(x))\}$ at $x = 2$

_____ f) $\frac{d}{dx} \{\sqrt{f(x)}\}$ at $x = 2$

_____ g) $\frac{d}{dx} \left\{ \frac{1}{g(x)} \right\}$ at $x = 3$

_____ h) If $h(x) = \sqrt{f^2(x) + g^2(x)}$, then find $h'(2)$.

2. Let $y = f(x)$ be the continuous function satisfying the equation $x^5 + x^4y - xy^2 - y^3 = 0$ and containing the points $\left(-\frac{1}{2}, \frac{1}{2}\right)$, $(-2, 2)$ and $(2, 4)$.

a) Find $\frac{dy}{dx}$ at points $\left(-\frac{1}{2}, \frac{1}{2}\right)$ and $(-2, 2)$ _____

Find $\frac{dy}{dx}$ at point $(2, 4)$ _____

3. Let f and its inverse, f^{-1} , be differentiable functions with $f(x)$ values at $x = 1$, $x = 2$, and $x = 3$ as indicated in the table below:

x	$f(x)$	$f'(x)$
1	3	4
2	1	5
3	2	6

HINT:

a) Point on f \Rightarrow Point on f^{-1}
 $(1, 3)$ \Rightarrow $(3, 1)$
 $(2, 1)$ \Rightarrow $(\underline{\hspace{1cm}}, \underline{\hspace{1cm}})$
 $(3, 2)$ \Rightarrow $(\underline{\hspace{1cm}}, \underline{\hspace{1cm}})$

b) Find the derivative of f^{-1} at $\begin{cases} x = 1 \underline{\hspace{1cm}} \\ x = 2 \underline{\hspace{1cm}} \end{cases}$