



3055 BA SANGAM COLLEGE

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Worksheet 22

School: Ba Sangam College
Subject: Mathematics

Year / Level: 13
Name of student: _____

Strand	8 - Differentiation
Sub strand	8.1 - Derivatives of functions
Content Learning Outcome	Differentiate using rules

Derivatives of Functions

Ref. Yr 13 Mathematics Textbook pg. 187 - 189

Common Derivatives

- To differentiate, $y = kx^n$, multiply the coefficient k by the power n and then reduce the power by one.

$$y = x^n$$
$$y' \text{ or } \frac{dy}{dx} = n \cdot x^{n-1}$$

$$f(x) = ax^n$$
$$f'(x) = (n \times a)x^{n-1}$$

- Derivative of a constant is equal to zero.
- $y = e^x$ has a special property that its derivative is the function itself.
 $y = e^x$
 $\frac{dy}{dx} = e^x$

➤ Derivatives of trigonometric and logarithmic functions

$y=f(x)$	$\frac{dy}{dx}$ or $f'(x)$
$\ln x$	$\frac{1}{x}$
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$

🔗 **Example 1** Find the derivative of $f(x) = x^2 - 1$

✍ **Answer**

$$\begin{aligned} f(x) &= x^2 - 1 \\ f'(x) &= 2x^{2-1} - 0 \\ &= 2x \end{aligned}$$

🔗 **Example 2** Differentiate $g(x) = 3x^2 + \sqrt[3]{x}$

✍ **Answer**

$$\begin{aligned} g(x) &= 3x^2 + x^{\frac{1}{3}} \\ g'(x) &= 3 \times 2 x^{2-1} + \frac{1}{3} x^{\frac{1}{3}-1} \\ &= 6x + \frac{1}{3} x^{-\frac{2}{3}} \end{aligned}$$

🔗 **Example 3** Find the derivative of $y = 4x^2 + 3e^x$

✍ **Answer**

Differentiate term by term

Power rule exponential

$$\begin{aligned} y &= 4x^2 + 3e^x \\ y' &= 4 \times 2x^{2-1} + 3e^x \\ &= 8x + 3e^x \end{aligned}$$

🔗 **Example 4** Find the derivative of $y = \sin x + \ln x$

✍ **Answer**

Differentiate term by term

$$y = \sin x + \ln x$$

$$y' = \cos x + \frac{1}{x}$$

ACTIVITY: Find the derivative of the following:

a) $y = \frac{1}{x^2} + 3\sqrt{x} - 20$

(2 marks)

b) $g(x) = \frac{1}{3x^3} - 5 \cos x$

(2 marks)

c) $f(x) = 3x^2 + e^x - 42$

(2 marks)

d) $h(x) = \tan x + \ln x$

(2 marks)

THE END