GRADE 12
Calculus 2– Differential Rules
WEBSITE NOTES

TOPIC:

- Rules of differentiation.

NOTE: The notation we use for the derivative of $y = f(x)$ is

$f'(x)$ or y' or $\frac{dy}{dx}$ or $D_x[f(x)]$.

When we find the derivative of a function, we say we **differentiate** the function.

Do the Following from your Textbook

Page 155 Exercise 6

1, 2, 3, 15

Limit Example

$$\lim_{x \to 0} \frac{x^2 - 2x}{x}$$

$\lim_{x \to 0} \frac{x^2 - 2x}{x}$
In mathematical language is:
THE LIMIT OF $\frac{x^2 - 2x}{x}$ AS x TENDS TO (MOVES TO) 0

Answer

$$\lim_{x \to 0} \frac{x(x-2)}{x}$$

Factorise first if needed to. This example we factorise by taking out the common factor

$$\lim_{x \to 0} x - 2$$

Simplify the expression. This example we can cancel the top x with the bottom x.

$$(0) - 2 = -2$$

Substitute the value that the variable moves towards. $\lim_{x \to 0}$

Note that the $\lim_{x \to 0}$ is no longer part of the expression when we substitute in.

LIMITS

Try the following exercise Page 143 Exercise 1. Do it as example above. Do not worry about drawing the table as indicated in Exercise.

B, C, D, E, F, G

Answers

Exercise 6 Page 155

1. $y = 3x^2 - \frac{2}{x}$
   $y = 3x^2 - 2x^{-1}$
   $\frac{dy}{dx} = 6x + 2x^{-2}$
   $\frac{dy}{dx} = 6x + \frac{2}{x^2}$

2. $Dx\left[\frac{x^3-x+5}{x}\right]$
   $= Dx\left[\frac{x^3}{x} - \frac{x}{x} + \frac{5}{x}\right]$
   $= Dx[x^2 - 1 + 5x^{-1}]$
   $= [2x - 0 - 5x^{-2}]$
   $= \left[2x - 0 - \frac{5}{x^2}\right]$

3. 1

15. $\frac{2}{3x^{\frac{1}{3}}} - \frac{3}{5^{\frac{2}{5}}}$

Exercise 1 Page 143

B. $\lim_{x\to 3} \frac{(x-2)(x-3)}{5(x-3)}$

$\lim_{x\to 3} \frac{(x-2)}{5}$

$\frac{((3)-2)}{5} = \frac{1}{5}$

C. 6

D. $\frac{7}{3}$

E. $\lim_{x\to -2} \frac{3}{s+2}$

$\frac{3}{(-2)+2} = \frac{3}{0} = Undefined \ \therefore the\ limit\ does\ not\ exist$

F. -3

G. $\frac{4}{3}$