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SECOND TERM E-LEARNING NOTE

SUBJECT: MATHEMATICS **CLASS: SS 3**

SCHEME OF WORK

WEEK	TOPIC
1.	Calculation on interest on bonds and debentures using logarithm table and problems on taxes and value added tax.
2.	Coordinate Geometry of straight line: Cartesian coordinate graphs, distance between two points, midpoint of the line joining two points.
3.	Coordinate Geometry of straight lines: Gradient and Intercepts of a line, angle between two intersecting straight lines and application.
4.	Differentiation of algebraic functions: meaning of differentiation, differentiation from first principle and standard derivatives of some basic functions.
5.	Differentiation of algebraic functions: Basic rules of differentiation such as sum and difference, product rule, quotient rule and maximal and minimum application.
6.	Integration and evaluation of simple algebraic functions: Definition, method of integration: substitution, partial fraction and integration by parts, area under the curve and use of Simpson's rule.
7– 12.	Revision and mock examination.

REFERENCE TEXT

- **New General Mathematics for SS book 3 by J.B Channon**
- **Essential Mathematics for SS book 3**
- **Mathematics Exam Focus**
- **Waec and Jamb past Questions**

WEEK ONE

- Calculation on interest on bonds and debentures using logarithm table
- Problems on taxes and value added tax.

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WEEK TWO

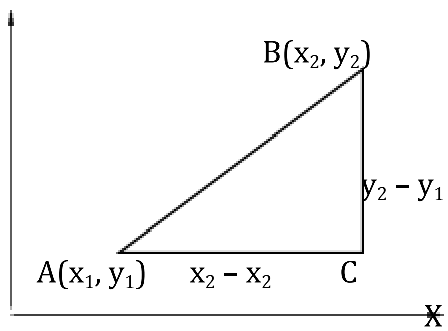
- Coordinate Geometry of straight line: Cartesian coordinate graphs
- distance between two points
- midpoint of the line joining two points
- Coordinate Geometry of Straight line:
- Cartesian coordinate graph:

Distance between two lines:

In the figure below, the coordinates of the points A and B are (x_1, y_1) and (x_2, y_2), respectively. Let the length of AB be l.

y

l



Using Pythagoras theorem:

$AB^2 = AC^2 + BC^2$

$l^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

$$\mathbf{l = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}}$$

Example:

Find the distance between the each pair of points: a. (3, 4) and (1, 2) b. (3, - 3) and (- 2, 5)

Solution:

Using $l = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

a. $l = \sqrt{(3 - 1)^2 + (4 - 2)^2}$

$l = \sqrt{2^2 + 2^2}$

$l = \sqrt{8} = 2\sqrt{2}$ units

b. $l = \sqrt{(3 - (-2))^2 + (-3 - 5)^2}$

$= \sqrt{5^2 + (-8)^2}$

$= \sqrt{25 + 64} = \sqrt{89} = 9.43$ units

Evaluation: Find the distance between the points in each of the following pairs leaving your answers in surd form: 1. (-2, - 5) and (3, - 6) 2. (- 3, 4) and (- 1, 2)

Mid-point of a line:

The mid-point of the line joining two points:

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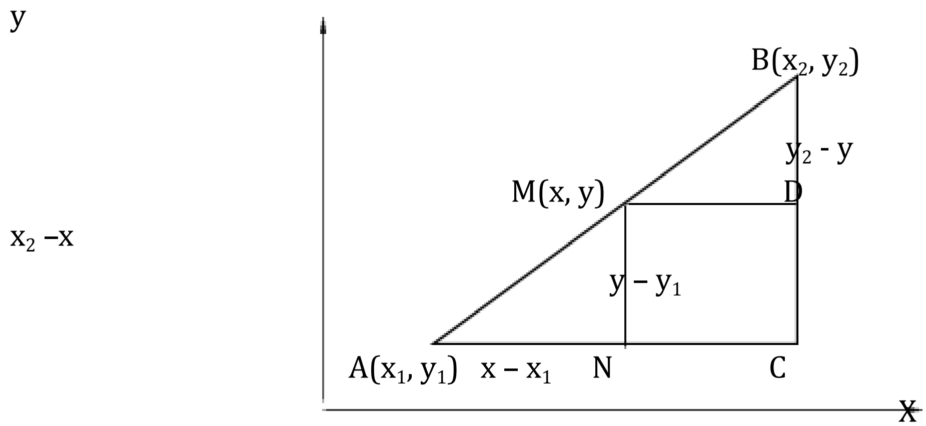

Triangle MAN and BMD are congruent, so AM = MD and BD = MN

$$x - x_1 = x_2 - x \qquad\qquad y - y_1 = y_2 - y$$

$$x + x = x_2 + x_1 \qquad\qquad y + y = y_2 + y_1$$

$$2x = x_2 + x_1 \qquad\qquad 2y = y_2 + y_1$$

$$\mathbf{x = \frac{x_2 + x_1}{2}} \qquad\qquad \mathbf{y = \frac{y_2 + y_1}{2}}$$

Hence, the **mid-point** of a straight line joining two is $\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$

Example: Find the coordinates of the mid-point of the line joining the following pairs of points.

a. (3, 4) and (1, 2) b. (2, 5) and (- 3, 6)

Solution:

Mid-point = $\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}$

a. Mid-point = $\frac{1 + 3}{2}, \frac{4 + 2}{2}$ = (2, 3)

b. Mid-point = $\frac{-3 + 2}{2}, \frac{6 + 5}{2}$ = $-\frac{1}{2}, \frac{11}{2}$

Evaluation: Find the coordinates of the mid-point of the line joining the following pairs of points.

a. (- 2 , - 5) and (3, - 6) b. (3, 4) and (- 1, - 2)

General Evaluation

1. Find the distance between the points in each of the following pairs leaving your answers in surd form: 1. (7, 2) and (1, 6)
2. What is the value of r if the distance between the points (4, 2) and (1, r) is 3 units?
3. Find the coordinates of the mid-point (-3, -2) and (-7, - 4)

Reading Assignment: NGM for SS 3 Chapter 9 page 77 – 78,

Weekend Assignment:

1. Find the value of $\alpha^2 + \beta^2$ if $\alpha + \beta = 2$ and the distance between the points $(1, \alpha)$ and $(\beta, 1)$ is 3 units.

2. The vertices of the triangle ABC are A (7, 7), B (- 4, 3) and C (2, - 5). Calculate the length of the longest side of triangle ABC.
3. Using the information in '2' above, calculate the line AM, where M is the mid-point of the side opposite A.

WEEK THREE

- Coordinate Geometry of straight lines:
- Gradient and Intercepts of a line
- Angle between two intersecting straight lines and application

Gradient and Intercepts of a line

Gradient of a line of the form $y = mx + c$, is the coefficient of x, which is represented by m and c is the intercept on the y axis.

Example

1. Find the equation of the line with gradient 4 and y-intercept -7.

Solution

$m = 4, c = - 7,$

Hence, the equation is; $y = 4x - 7$.

Evaluation:

1.What is the gradient and y intercept of the line equation $3x - 5y + 10 = 0$?

2. Find the equation of the line with gradient - 9 and y-intercept 4.

Gradient and One Point Form

The equation of the line can be calculated given one point (x, y) and gradient (m) by using the formula; $y - y_1 = m(x - x_1)$

Example

Find the equation of the line with gradient -8 and point(3, 7).

Solution

$m = - 8, (x_1, y_1) = (3,7)$

Equation: $y - 7 = - 8(x - 3)$

$y = -8x + 24 + 7$

$y = -8x + 31$

Evaluation:

1. Find the equation of the line with gradient 5 and point(-2, -7).
2. Find the equation of the line with gradient -12and point (3, -5).

Two Point Form:

Given two points (x1, y1) and (x2, y2), the equation can be obtained using the formula:

y2 - y1 = y - y1

x2 - x1   x - x1

Example: Find the equation of the line passing through (2,-5) and (3,6).

Solution

6 - (-5)/3 - 2 = y - (-5)/x - 2

11 = y + 5/x - 2

11(x - 2) = y + 5

11x - 22 = y + 5

y - 11x + 27 = 0

Evaluation:

1.Find the equation of the line passing through (3, 4) and (-1, -2).

2.Find the equation of the line passing through (-8, 5) and (-6, 2).

Angles between Lines

Parallel lines:

The angle between parallel lines is 0^0 because they have the same gradient

Perpendicular Lines:

Angle between two perpendicular lines is 90^0 and the product of their gradients is – 1. Hence, $m_1m_2 = - 1$

Examples:

1. Show that the lines y = -3x + 2 and y + 3x = 7 are parallel.

solution:

Equation 1: y = -3x + 2, $m_1 = -3$

Equation 2: y + 3x = 7,

y = -3x + 7, $m_2 = - 3$

since; $m_1 = m_2 = - 3$, then the lines are parallel

2. Given the line equations x = 3y + 5 and y + 3x = 2, show that the lines are perpendicular.

solutions:

Equation 1:   x = 3y + 5,   make y the subject of the equation.

3y = x + 5

y = x/3 + 5/3

$m_1 = 1/3$

Equation 2:   y + 3x = 2,

y = - 3x + 2, $m_2 = -3$

hence: m_1 x m_2 = 1/3 x – 3 = - 1

since: $m_1m_2 = - 1$, then the lines are perpendicular.

Evaluation: State which of the following pairs of lines are: (i) perpendicular   (ii) parallel

(1)   y = x + 5 and y = - x + 5   (2). 2y – 6 = 5x and 3 – 5y = 2x   (3) y = 2x – 1 and 2y – 4x = 8

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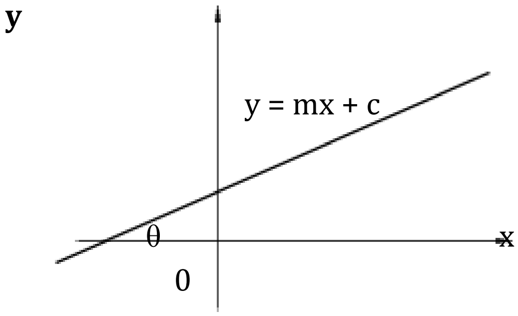
Angles between Intersecting Lines:



The gradient of y = mx + c is tan θ. Hence **m = tan θ** can be used to calculate angles between two intersecting lines. Generally the angle between two lines can be obtained using: $\tan 0 = \frac{m2 - m1}{1 + m1m2}$

Example: Calculate the acute angle between the lines y=4x -7 and y = x/2 + 0.5.

Solution:

Y=4x -7, m1= 4, y=x/2+0.2, m2 =1/2.

$\text{Tan } O = \frac{0.5 - 4.}{1 + (0.5*4)} = -3.5/3$

Tan O =- 1.1667

O=tan-1(-1.1667) = 49.4

Evaluation:Calculate the acute angle between the lines y=3x -4 and x - 4y +8 = 0.

General Evaluation:

1.Calculate the acute angle between the lines y=2x -1 and 2y + x = 2.

2.If the lines 3y=4x -1 and qy= x + 3 are parallel to each other, find the value of q.

3.Find the equation of the line passing through (2,-1) and gradient 3.

Reading Assignment: NGM for SS 3 Chapter 9 page 75 – 81

Weekend Assignment

1.Find the equation of the line passing through (5,0) and gradient 3.

2.Find the equation of the line passing through (2,-1) and (1, -2).

3. Two lines y=3x - 4 and x - 4y + 8=0 are drawn on the same axes.

(a) Find the gradients and intercepts on the axes of each line.

(b) Find the equation parralel to x -4y + 8=0 at the point (3, -5)

WEEK FOUR

- Differentiation of algebraic functions: meaning of differentiation
- Differentiation from first principle
- Standard derivatives of some basic functions.

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Consider the curve whose equation is given by $y = f(x)$ Recall that $m = y_2 - y_1 = f(x+x)-f(x)$

$x_2 - x_1 x$

As point B moves close to A, dx becomes smaller and tends to zero.

The limiting value is written on Lim $f(x + x) - f(x)$ and is denoted by as $x \to 0$

dx

$f^1(x)$ is called the **derivative of f(x)** and the **gradient function of the curve**

The process of finding the derivative of f(x) is called differentiation. The rotations which are commonly used for the derivative of a function are $f^1(x)$ read as f – prime of x, df/dx read as dee x of f
df/dx read dee - f dee- x, dy/dx read dee - y dee- x

If $y = f(x)$, this $dy/dx = f^1(x)$ (it is called the differential coefficient of y with respect to x.

Differentiation from first principle: The process of finding the derivative of a function from the consideration of the limiting value is called differentiation from first principle.

Example 1

Find from first principle, the derivative of $y = x^2$

Solution

$y = x^2$

$y + y = (x + x)^2$

$y + y = x^2 + 2xx + (x)^2$

$y = x^2 + 2xx + (x)^2 - y$

$y = x^2 + 2xx + (x)^2 - x^2$

$y = 2xx + (x)^2$

$y = (2x + x)x$

$y = \underline{2x} + x$

x

Lim $x = 0$

$\frac{dy}{dx} = 2x$

Example 2:

Find from first principle, the derivative of 1/x

Solution

Let $y = \frac{1}{x}$

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

$y = \frac{1}{x + x} - y$

$y = \frac{1}{x + x} - \frac{1}{x}$

$y = \frac{x - (x + x)}{(x + x)x}$

$y = \frac{x - x - x}{x^2 + xx}$

$\frac{dy}{x^2 + x} = -x$

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$y = \frac{-1}{x\quad x^2 + x}$

Lim x = 0

$\frac{dy}{dx} = \frac{-1}{x^2}$

Evaluation: Find from first principle, the derivatives of y with respect to x:

1. $Y = 3x^3$ 2. $Y = 7x^2$ 3. $Y = 3x^2 – 5x$

Rules of Differentiation: Let $y = x^n$

$y + dy = (x + dx)^n$

$= x^n + nx^{n-1}dx + n\frac{(n-1)\, x^{n-2}(dx)^2 + \ldots (dx)^n}{2!}$

$= x^n + n\,x^{n-1}dx + n\frac{(n-1)\, x^{n-2}\,(dx)^2}{2!} + \text{---} + (dx)^n - x^n$

$= nx^{n-1}dx + n\frac{(n – 1)\, x^{n–1}\,(dx)^2}{2!}$

$dy/dx = n\,^{xn-1} + n\,(n –1)\, x^{n-1}\, dx$

Lim $dy/dx = nx^{n-1}$

$dx = 0$

Hence; $\mathbf{dy/dx = nx^{n-1}}$ **if** $\mathbf{y = x^n}$

Example 3:

Find the derivative of the following with respect to x: (a) x^7 (b) $x^{½}$ (c) $5x^2 – 3x$ (d) $- 3x^2$ (e) $y = 2x^3 – 3x + 8$

Solution

a. Let $y = x^7$

$dy/dx = 7\,x^{7-1} = 7x^6$

b. Let $y = x^{½}$

$dy/dx = ½\, x^{½ -1} = ½\, x^{- ½} = \frac{1}{2\sqrt{x}}$

c. Let $y = 5x^2 – 3x$

$dy/dx = 10x – 3$

d. Let $y = - 3x^2$

$dy/dx = 2\times - 3x^{2-1} = - 6x$

e. Let $y = 2x^3 – 3x + 8$

$dy/dx = 3 \text{ x } 2x^{3-1} – 3 + 0$

$= 6x^2 – 3$

Evaluation:

1. If $y=5x^4$,find dy/dx 2.Given that $y= 4x^{-1}$ find y^1

General Evaluation

1. Find, from first principles, the derivative of $4x^2 – 2$ with respect to x.
2. Find the derivative of the following a.$3x^3 – 7x^2 – 9x + 4$ b. $2x^3$ c. $3/x$

3. Using idea of difference of two square; simplify $243x^2 - 48y^2$

4. Expand (2x -5)(3x-4)
5. If the gradient of $y=2x^2-5$ is -12 find the value of y.

Reading Assignment: NGM for SS 3 Chapter 10 page 82 -88,
Weekend Assignment
Objective

1. Find the derivative of $5x^3$ (a) $10x^2$ (b) $15x^2$ (c) $10x$ (d) $15x^3$
2. Find dy/dx, if $y = 1/x^3$ (a) $-3/x^4$ (b) $3/x^4$ (c) $4/x^3$ (e) $-4/x^3$
3. Find $f^1(x)$, if $f(x) = x^3$ (a) $3x$ (b) $3x^2$ (c) $\frac{1}{2}x^3$ (d) $2x^3$
4. Find the derivative of $1/x$ (a) $1/x^2$ (b) $-1/x^2$ (c) $-x$ (d) $-x^2$
5. If $y = -2/3\,x^3$. Find dy/dx (a) $4/3\,x^2$ (b) $2x^2$ (c) $-2x^2$ (d) $-2x$

Theory

1. Find from first principle, the derivative of $y = x + 1/x$
2. Find the derivative of $2x^2 - 2/x^3$

WEEK FIVE

- Differentiation of algebraic functions:
- Basic rules of differentiation such as sum and difference, product rule, quotient rule
- Maximal and minimum application.

Derivative of algebraic functions

Let f, u, v be functions such that

$f(x) = u(x) + v(x)$

$f(x + x) = u(x + x) + v(x + x)$

$f(x + x) - f(x) = \{u(x + x) + v(x + x) - v(x + x) - u(x) - v(x)\}$

$= u(x + x) - u(x) + v(x + x) - v(x)$

$f(x + x) - f(x) = u(x + x) - u(x) + v(x + x) - v(x)$

Lim $f(x + x) - f(x) = U^1(x) + V^1(x)$

if y = u + v and u and v are functions of x, then **dy/dx = du/dx + dv/dx**

Examples:Find the derivative of the following

1) $2x^3 - 5x^2 + 2$ 2) $3x^2 + 1/x$ 3) $2x^3 + 2x^2 + 1$

Solution

1. Let $y = 2x^3 - 5x^2 + 2$
   $dy/dx = 6x^2 - 10x$

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

3. Let $y = 2x^3 + 2x^2 + 1$
   $dy/dx = 6x^2 + 4x$

Evaluation: 1. If $y = 3x^4 - 2x^3 - 7x + 5$. Find dy/dx

2.Find $\frac{d}{Dx}(8x^3 - 5x^2 + 6)$

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Function of a function (chain rule)
Suppose that we know that y is a function of u and that u is a function of x, how do we find the derivative of y with respect to x?
Given that y = f(x) and u = h(x), what is dy/dx?
dy/dx = , this is called the chain rule

Examples
Find the derivative of the following.(a)$y = (3x^2 - 2)^3$ (b) $y = (1 - 2x^3)$ (c) $5/(6-x^2)^3$
Solution

1. $y = (3x^2 - 2)^3$
   Let $u = 3x^2 - 2$
   $y = (3x^2 - 2)^3 \Rightarrow y = u^3$
   $y = u^3$
   $dy/du = 3u^2$
   $du/dx = 6x$

   $dy/dx = = 3u^2 \text{ x } 6x$
   $= 18xu^2 = 18x(3x^2 - 2)^2$

2. $y = (1 - 2x^3)^{1/2} \Rightarrow (1 - 2x^3)^{1/2}$
   Let $u = 1 - 2x^3$, hence $y = u^{1/2}$
   $dy/dx = = \frac{1}{2} u^{-1/2} \text{ x}(-6x^2)$
   $= -3x^2 u^{-1/2} = \frac{-3x^2}{u^{1/2}}$

   $\frac{-3x^2}{\sqrt{u}} = \frac{-3x^2}{\sqrt{(1 - 2x^3)}}$

3. $y = \frac{5}{(6 - x^2)^3} = 5(6 - x^2)^{-3}$
   Let $u = 6 - x^2$
   $y = 5(u)^{-3}$
   $dy/du = -15u^{-4}$
   $du/dx = -2x$
   $dy/dx = dy/du \text{ X } du/dx = -15u^{-4} \text{ x } (-2x) = 30x\, u^{-4} = 30x\,(6 - x^2)^{-4}$
   $= \frac{30x}{(6 - x^2)^4}$

Evaluation:
1. Given that $y = \frac{1}{(2x + 3)^4}$ find dy/dx
2. If $y = (3x^2 + 1)^3$, Find dy/dx

Product Rule
We shall consider the derivative of y = uv where u and v are function of x.
Let y = uv
Then y + y = (u +u)(v + v)
= uv + uv + vu +uv
y = uv + uv + vu+ uv – uv
y= uv + vu + uv

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y= uv + vu + uv
x x

As x =>0 ,u=> 0 , v=> 0

Lim y = Lim uv + Lim vu + Lim uv
x=>0 x x=>0 x x=>0 x x=>0 x

Hence **dy/dx= U dv + Vdu**
dxdx

Examples
Find the derivatives of the following.
(a) $y = (3 + 2x)(1 - x)$ (b) $y = (1 - 2x + 3x^2)(4 - 5x^2)$

Solution
1. $y = (3 + 2x)(1 - x)$
Let $u = 3 + 2x$ and $v = (1 - x)$
$du/dx = 2$ and $dv/dx = -1$

$dv/dx = u\frac{dv}{dx} + v\frac{du}{dx}$
$= (1 - x)\,2 + (3 + 2x)(-1) \quad = 2 - 2x - 3 - 2x$
$dy/dx = -1 - 4x$

2. $y = (1 - 2x + 3x^2)(4 - 5x^2)$
Let $u = (1 - 2x + 3x^2)$ and $v = (4 - 5x^2)$
$du/dx = -2 + 6x$ and $dv/dx = -10x$

$dy/dx = u\frac{dv}{dx} + v\frac{du}{dx}$
$= (1 - 2x + 3x^2)(-10x) + (4 - 5x^2)(-2 + 6x)$
$= -10x + 20x^2 - 30x^3 + (-8 + 10x^2 + 24x - 30x^3)$
$= -10x + 20x^2 - 30x^3 - 8 + 10x^2 + 24x - 30x^3$
$= 14x + 30x^2 - 60x^3 - 8$

Evaluation
Given that (i) $y = (5+3x)(2-x)$ (ii) $y = (1+x)(x+2)^{3/2}$, find dy/dx

Quotient Rule:
If $y = \frac{u}{v}$
then; $\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$

Examples:
Differentiate the following with respect to x. (a) $\frac{x^2 + 1}{1 - x^2}$ (b) $\frac{(x - 1)^2}{\sqrt{x}}$

Solution:
1. $y = \frac{x^2 + 1}{1 - x^2}$
Let $u = x^2 + 1$ $du/dx = 2x$
$v = 1 - x^2$ $dv/dx = -2x$

$\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$

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$dy/dx = \dfrac{(1 - x^2)(2x) - (x^2 + 1)(-2x)}{(1 - x^2)^2}$

$= \dfrac{2x - 2x^3 + 2x^3 + 2x}{(1 - x^2)^2}$

dy/dx $= \dfrac{4x}{(1 - x^2)^2}$

2. $y = \dfrac{(x - 1)^2}{\sqrt{x}}$

Let $u = (x - 1)^2$ $du/dx = 2(x - 1)$

$v = \sqrt{x}$ $dv/dx = 1/2\sqrt{x}$

$dy/dx = \dfrac{\sqrt{x}\, 2(x - 1) - (x - 1)^2\, 1/2\sqrt{x}}{(\sqrt{x})^2}$

$dy/dx = \dfrac{\sqrt{x}\, 2(x - 1) - (x - 1)^2\, 1/2\sqrt{x}}{x}$

Evaluation: Differentiate with respect to x: (1) $\dfrac{(2x + 3)^3}{(x^3 - 4)^2}$ (2) $\dfrac{\sqrt{x}}{\sqrt{(x + 1)}}$

Applications of differentiation:

There are many applications of differential calculus.

Examples:

1. Find the gradient of the curve $y = x^3 - 5x^2 + 6x - 3$ at the point where $x = 3$.

   Solution:

   $Y = x^3 - 5x^2 + 6x - 3$

   $dy/dx = 3x^2 - 10x + 6$

   where $x = 3$; $dy/dx = 3(3^2) - 10(3) + 6$

   $= 27 - 30 + 6$

   $= 3.$

2. Find the coordinates of the point on the graph of $y = 5x^2 + 8x - 1$ at which the gradient is $- 2$

   Solution:

   $Y = 5x^2 + 8x - 1$

   $dy/dx = 10x + 8$

replace; dy/dx by $- 2$

$10x + 8 = - 2$

$10x = - 2 - 8$

$x = -10/10 = - 1$

3. Find the point at which the tangent to the curve $y = x^2 - 4x + 1$ at the point $(2, -3)$

   Solution:

   $Y = x^2 - 4x + 1$

$dy/dx = 2x - 4$

at point $(2, -3)$: $dy/dx = 2(2) - 4$

$dy/dx = 0$

tangent to the curve: $y - y1 = dy/dx(x - x1)$

$y - (-3) = 0\,(x - 2)$

$y + 3 = 0$

Evaluation:

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1. Find the coordinates of the point on the graph of $y = x^2 + 2x - 10$ at which the gradient is 8.
2. Find the point on the curve $y = x^3 + 3x^2 - 9x + 3$ at which the gradient is 15.

Velocity and Acceleration

Velocity: The velocity after t seconds is the rate of change of displacement with respect to time.

Suppose; s = distance and t = time,

Then; ***Velocity = ds/dt***

Acceleration: This is the rate of change of velocity compared with time.

Acceleration = dv/dt

Example:

A moving body goes s metres in t seconds, where $s = 4t^2 - 3t + 5$. Find its velocity after 4 seconds. Show that the acceleration is constant and find its value.

Solution:

$S = 4t^2 - 3t + 5$

$ds/dt = 8t - 3$

velocity $= ds/dt = 8(4) - 3$

$= 32 - 3$

$= 29$

Acceleration: $dv/dt = 8$.

Maxima and Minimal

1. Find the maximum and minimum value of y on the curve $6x - x^2$.

   Solution:

   $y = 6x - x^2$

$dy/dx = 6 - 2x$

equatedy/dx = 0

$6 - 2x = 0$

$6 = 2x$

$X = 3$

The turning point is (3, 9)

2. Find the maximum and minimum of the function $x^3 - 12x + 2$.

   Solution:

   $Y = x^3 - 12x + 2$

   $dy/dx = 3x^2 - 12$

   $3x^2 - 12 = 0$

   $3x^2 = 12$

   $x^2 = 12/3$

   $x^2 = 4$ $\quad x = \pm 2$

   minimum point occur when $d^2y/dx^2 > 0$

   maximum point occurs when $d^2y/dx^2 < 0$

   $d^2y/dx^2 = 6x$

   substitute x = 2; $d^2y/dx^2 = 6 \times 2 = 12$

therefore: the function is minimum at point x = 2 and y = - 14

substitute x = - 2; $d^2y/dx^2 = 6(-2) = -12$

therefore: the function is maximum at point x = - 2 and y = 18

Evaluation:

Name____ Date________________

1. A particle moves in such a way that after t seconds it has gone s metres, where $s = 5t + 15t^2 - t^3$
2. Find the maximum and minimum value of y on the curve $4 - 12x - 3x^2$.

General Evaluation

Use product rule to find the derivative of

1. $y = x^2 (1 + x)^{½}$
2. $y = \sqrt{x}\,(x^2 + 3x - 2)^2$
3. Find the derivative of $y = (7x^2 - 5)^3$
4. Using completing the square method find t if $s = ut + \frac{1}{2}at^2$
5. If 3 is a root of the equation $x^2 - kx + 42 = 0$ find the value of k and the other root of the equation

READING ASSIGNMENT: NGM for SS 3 Chapter 10 page 90 -101,

WEEKEND ASSIGNMENT

OBJECTIVE

1.Differentiate the function $4x^4 + x^3 - 5$ (a)$4x^3 + 3x^2$ (b)$16x^2 + 3x^2$ (c)$16x^3 + 3x^2$ (d)$16x^4 + 3x^2$

2.Find d^2y/dx^2 of the function $y = 3x^5$ wrt x. (a) $15x^3$ (b) $45x^4$ (c) $60x^3$ (d) $3x^5$ (e) $12x^3$

3.If $f(x) = 3x^2 + 2/x$ find $f^1(x)$ (a) $6x + 2$ (b) $6x + 2/x^2$ (c) $6x - 2/x^2$ (d)$6x - 2$

4.Find the derivative of $2x^3 - 6x^2$ (a) $6x^2 - 12x$ (b) $6x^2 - 12x$ (c) $2x^2 - 6x$ (d) $8x^2 - 3x$

5.Find the derivative of $x^3 - 7x^2 + 15x$ (a) $x^2 - 7x + 15$ (b) $3x^2 - 14x + 15$ (c) $3x^2 + 7x + 15$ (d) $3x^2 - 7x + 15$

THEORY

1. Differentiate with respect to x. $y^2 + x^2 - 3xy = 4$
2. Find the derivative of $3x^3(x^2 + 4)^2$