5TH FORM, 3 UNIT MATHEMATICS

TERM 1, 1993, ASSESSMENT TEST

TIME: 55 minutes

QUESTION 1

i)   Find the value of n such that $\sqrt{80} + \sqrt{45} = \sqrt{n}$

ii) Write the expression $\dfrac{1 + \sqrt{7}}{3 - \sqrt{7}}$ in the form $a + b\sqrt{7}$ where both a and b are rational.

iii) Factorise each expression:

    (a) $x^2 - y^2 - 4x - 4y$ (b) $2a^3 - 54$ (c) $x^2 - y^2 - 4y - 4$

iv) Solve the equation $|x + 3| = 1 - 3x$.   Test the possible solutions.

v)   Graph on a number line all solutions of $|x - 3| < 2$

QUESTION 2.

i)   Given that $F(x) = \dfrac{1}{1 - x}$,

    (a)   evaluate : (a) $F(-2) - F(2)$ (b) $F(\tfrac{1}{x}) - F(-x) = 2$

ii) Find each limit:

    (a) $\lim\limits_{x \to 4} \dfrac{x^2 - 16}{2x^2 - 3x - 20}$ (b) $\lim\limits_{h \to \infty} \dfrac{2h^2 - 3h - 20}{h^2 - 16}$

iii) Find the derivative of each function:

    (a) $y = \dfrac{1 - 2x}{2x + 1}$ (b) $y = \dfrac{5x^3 - x^2 + 8}{x^2}$ (c) $f(x) = \sqrt[3]{1 - x^3}$

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QUESTION 3.

i) Calculate the perpendicular distance from A(2,-6) to the line $l : 4x - 3y + 9 = 0$.

ii) A(1,-3) and B(6,7) are two given points. Find the co-ordinates of the point P which divides the interval AB internally in the ratio 2:3.

iii) $(x+5)^2 + (y-2)^2 = 40$ is the equation of a circle.

    (a)   What are the co-ordinates of its centre?

    (b)   State the length of the radius.

    (c)   Prove that the line 3x - y - 3 = 0 is a tangent to the circle.

(iv)   (a)   Write down the equation of the family of lines that are all concurrent with 3x - y - 3 = 0 and 2y = x + 4.

    (b)   Hence, or otherwise, find the member of that family of lines hwich passes through P(-1,4)

QUESTION 4.

i)   L(3,4) is a point on the graph of $y = \dfrac{12}{x}$ The tangent at L cuts the X-axis at P and the Y-axes at Q. Find the co-ordinates of P and Q.

iii)   A spherical weather balloon is inflated with heliam at the rate of 1200 cm³ / min.
Find at what rate the surface area of the balloon is increasing at the moment when its radius is 50 cm. [For a sphere, $S = 4\pi r^2, V = \dfrac{4\pi r^3}{3}$]

From the points A and B on level ground on opposite sides of a tower TC, the angles of elevation of T are 55° and 36° respectively.

If A is 30m from the fot of the tower, how far is A from B?