CHUKA  UNIVERSITY

UNIVERSITY SUPPLEMENTARY/SPECIAL EXAMINATIONS.

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF

MATH 121/111: CALCULUS I

STREAMS: **TIME: 2 HOURS**

DAY/DATE: MONDAY 23/07/2018 **5.00 P.M - 7.00 P.M**

INSTRUCTIONS:

- All **Questions are COMPULSORY**
- Do not write anything on the Question paper.

QUESTION ONE. [30 MARKS]

(a) Given $x=\frac{t}{1-t} \wedge y=\frac{t^3}{1-t}$, determine $\frac{dy}{dx}$ at $x=1$ [3 Marks]

(b) Evaluate $\int_0^1 2x-3x^2+4x^3 ¿ dx$ [3 Marks]

(c) Evaluate $\lim ¿ x \to \infty \sqrt[3]{\frac{x^2+9x^{-6}}{13+125x^2}}$ [3 Marks]

(d) Using first principles, determine the derivertive of $y=\frac{7}{x}$ [4 Marks]

(e) Determine the equation of the tangent to the curve $y=\frac{3}{x^2}$ at $x=1$ [4 Marks]

(f) Using $y=\sqrt{x}$, determine $\sqrt{63}$ without a calculator or mathematical tables. [3 Marks]

(g) Find the areas enclosed by $y=2-x^2$ and $y=x^2-4x+2$. [5 Marks]

(h) Using the first derivertive test, find the interval for which $f(x)=x^3-\frac{3}{2}x^2$ is increasing or decreasing. [5 Marks]

QUESTION TWO [20 MARKS]

(a) Find the derivertive $\frac{dy}{dx}$ of the following functions:

(i) $y=\frac{x-5}{x+5}$ [3 Marks]

(ii) $y=4e^{-3x^2}$ [3 Marks]

(iii) $y=(2x+1)(5x^2-7)$ [2 Marks]

(iv) $\frac{y}{x}=e^y$ [3 Marks]

(v) $y=x^{x^2}$ [3 Marks]

(vi) $xy^3+y^2-5xy-x^2=7$ [3 Marks]

(b) If $x=\sin t$, $y=\cos 2t$, show that $\frac{d^2y}{dx^2}+4=0$ [3 Marks]

QUESTION THREE [20 MARKS]

(a) A spherical balloon is blown so that its volume increases at the rate of 0.5 cm ⅗. Determine the rate at which the radius increases when the volume of the balloon is 32 cm^3.

[6 Marks]

(b) Sketch the graph of $f(x)=\frac{2(x^2-9)}{x^2-4}$ [7 Marks]

(c) Find the co-ordinates of the point on the curve $y=x^3-6x^2+12x+2$ at which the tangent is parallel to the line $y-3x=0$. [7 Marks]

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