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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2017/2018 ACADEMIC YEAR
DIPLOMA IN BUSINESS INFORMATION TECHNOLOGY

DBT 012 -CALCULUS FOR BUSINESS INFORMATION

Date: 5th April 2017
Time: 12:00pm-2:00pm

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANYOTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

- a) Find the gradient of the curve whose equation is $y = \frac{1}{x^2}$ using the definition of a derivative. (4 Marks)
- b) Using the rules for differentiation, determine the gradient function $\frac{dy}{dx}$ of the function $y = 5x^3 + \frac{3}{x^4} + 5$ (2 Marks)
- c) Find the equation of the tangent and the normal to the curve $y = x^2$ at the point $x = 1$. If the normal meets the curve again at a point B, find the coordinates of B. (6 Marks)
- d) Use the chain rule to differentiate $y = (x^2 + 5x + 3)^7$ with respect to x . (2 Marks)
- e) Differentiate $y = (1 + x^2)^{\frac{1}{4}}$ with respect to x . (4 Marks)
- f) Using the product rule, differentiate $y = (x^2 - 5)(x + 2)^2$ with respect to x leaving your answer in simplified form. (5 Marks)
- g) If $y = \frac{(x-4)^2}{(x+4)^2}$ and $x \neq -4$, find $\frac{dy}{dx}$. (4 Marks)
- h) Determine $\frac{dy}{dx}$ if $y = \frac{\cot x}{(x+2)^3}$ (3 Marks)

QUESTION TWO (20 MARKS)

- a) Differentiate $y = (x+3)^6(x+5)^4$ with respect to x . (5 Marks)
- b) An object moving in a straight line has its displacement x metres from an origin O at time t seconds by $x = t(t-3)^2$. Determine
- The time taken when the object is at the origin (3 Marks)
 - The time taken when the object is instantaneously at rest (4 Marks)
 - The distance moved between $t = 0$ and $t = 2$ (4 Marks)
- c) A particle moving in a straight line has velocity ms^{-1} and displacement x metres at time t seconds where $v = (x^2 - 4)^{\frac{3}{2}}$ and $x \geq 2$. Show that the acceleration is zero when the particle is instantaneously at rest. (4 Marks)

QUESTION THREE (20 MARKS)

- a) Evaluate the integrals
- $\int_1^{27} x^{\frac{1}{3}} dx$ (2 Marks)
 - $\int_0^{\frac{\pi}{4}} \sin 2x dx$ (2 Marks)
- b) Calculate the area bounded by the parabola $y = 2 - x^2$ and the line $y = x$ (6 Marks)
- c) Find the distance travelled by an object along a line with velocity $v = \frac{2-t}{\sqrt{t}}$ from $t = 4$ to $t = 9$ (3 Marks)
- d) A particle is moving in a straight line and its acceleration after t seconds is given by $24t \text{ m/s}^2$.
- Find an expression for the displacement x metres after t seconds in terms of t . (2 Marks)
 - Given that at $t = 0$, $x = 0$ and that at $t = 2$, $x = 40$, find the displacement and the velocity when $t = 3$. (5 Marks)

QUESTION FOUR (20 MARKS)

- a) State the domain and the range of the function $s(x) = 3\sqrt{-3-x}$ (2 Marks)
- b) Find the y-coordinate and the gradient for the function $y = 6x^7 + 4$ (4 Marks)
- c) Given the function $y = 2x^3 - 21x^2 - 60x + 12$
- Sketch the graph (2 Marks)
 - State from the graph the $\lim_{x \rightarrow 4^-} g(x)$ (1 Mark)
 - Give one point where $g(x)$ is not continuous. Give reasons for your answer and state the type of discontinuity at the stated point (3 Marks)
- d) Find the equation of the tangent line to the graph of $y = x^3 + 2x^2 - 5x + 7$ at the point $x = 1$. Hence sketch the graph of the curve and its tangent line on the same axes. (8 Marks)

QUESTION FIVE (20 MARKS)

- a) A curve has the equation $y = 8x + 20 - x^2$
- Determine the coordinates of the points where the curve meets the axes (4 Marks)
 - Determine the coordinates and nature of turning points (4 Marks)
 - Sketch the curve (4 Marks)
 - Find the area bounded by the axes and the curve in the first quadrant (3 Marks)
- b) Determine the coordinates of the stationary points on the curve whose equation is $y = 2x^3 - 21x^2 - 60x + 12$ and determine their nature. (5 Marks)