AKENTEN APPIAH-MENKA UNIVERSITY OF SKILLS TRAINING AND ENTREPRENEURIAL DEVELOPMENT
DEPARTMENT OF MATHEMATICS EDUCATION
END OF SEMESTER EXAMINATION – AUGUST, 2021

COURSE CODE	**ITC 126**
COURSE TITLE	**CALCULUS**
DURATION	**2 HOURS**
LECTURER	**DR. EBENEZER BONYAH**
INSTRUCTION(S)	**1. The paper consist of two sections, section A and section B.** **2. Provide answers to questions in section A by writing the letter (A-D) that corresponds to the correct option on the first page of the ANSWER BOOKLET provided.** **3. There are three questions in section B, answer QUESTION ONE and any other one in the ANSWER BOOKLET provided.**

SECTION A(*30 marks)*

1. Which of the following statements truly represents $\lim_{x\to n} f(x) = b$?

A. The limit of $f(x)$ as x approaches b is n
B. The limit of $f(x)$ as n approaches x is b
C. The limit of $f(x)$ as n approaches b is x
D. The limit of $f(x)$ as x approaches n is b

2. Find $\frac{ds}{dt}$ if $s = (1+t)\sqrt{2}$.

A. $\frac{1+3t}{2\sqrt{t}}$

B. $\frac{2\sqrt{t}}{1+3t}$

C. $\frac{\sqrt{2t}}{2+3t}$

D. $\frac{\sqrt{t}}{2+3t}$

3. Evaluate $\int_1^3 e^x dx$

A. e^2

B. $2e$

C. $e^3 - e$

D. $3e - e^2$

4. Given a function $g(x) = x^3 - 4x^2 + 9x + 4$ at which interval is it continuous?

A. $(-\infty, \infty)$

B. $[4,9]$

C. $[-4,9]$

D. $[1,4]$

5. Find $\lim_{x\to 1} \frac{x-1}{\sqrt{x}-1}$

A. Undefined
B. 2
C. 0
D. None of these

6. If $f(x)=\frac{729x^9}{4}-21x^5+1$; then $\int f(x)dx$ gives _____.

A. $\frac{729x^8}{4}-21x^6+1+C$

B. $\frac{729x^8}{4}-21x^6+C$

C. $\frac{729x^{10}}{40}+\frac{7}{2}x^6+C$

D. $\frac{729x^{10}}{40}-\frac{7x^6}{2}+x+C$

7. At which value of x is the function $g(x)=\frac{x-1}{x-2}$ not continuous?

A. 2

B. 1

C. 0

D. None of these

8. Find an equation for the tangent line to the curve $y=\frac{2}{x}$ at the point (2, 1) on this curve.

A. $y=\frac{1}{2}x-2$

B. $y=-\frac{1}{2}x+2$

C. $y=x-4$

D. $y=4x-1$

9. Find $\int dx$

A. $1+C$

B. C

C. $x+C$

D. $-1+C$

Given the function

$$h(x)=\begin{cases}\frac{x^2-3x+10}{22-7x}, & \text{if } x\le 4\\ 11x^2+19, & \text{if } x>4\end{cases}$$

Use it to answer questions 10 and 11

10. Find $h\left(\frac{1}{2}\right)$

A. $\frac{74}{35}$

B. $\frac{47}{102}$

C. $\frac{102}{47}$

D. $\frac{35}{74}$

11. Solve for x if $h(-10)=3x$.

A. $\frac{69}{35}$

B. 35

C. $\frac{35}{69}$

D. 69

12. Find the domain of g, if $g(x)=\frac{3}{x^2-81}$

A. $\{x: x\in R, x\neq 9\}$

B. $\{x: x\in R, x\neq 3\}$

C. $\{x: x\in R, x\neq -3 \text{ or } 3\}$

D. $\{x: x\in R, x\neq -9 \text{ or } 9\}$

13. Differentiate the function $g(x)=(3x^2-2x+7)(4-x)$

A. $-9x^2+28x-15$

B. $9x^2-28x+15$

C. $3x^2-2x+7$

D. $-3x^2+2x-7$

14. Find the slope of the tangent line to $y=\sqrt{x}$ at $x=9$.

A. 3

B. $\frac{1}{3}$

C. 6

D. $\frac{1}{6}$

15. Given px^q, where p and q are constants, the derivative with respect to x is_____

A. qpx^{p-1}

B. pqx^{q-1}

C. px^{q-1}

D. qx^{p-1}

16. The derivative of a constant and a function is illustrated as_____

A. $\frac{d}{dx}[cf(x)]=\frac{d}{dx}[f(x)]$

B. $\frac{d}{dx}[cf(x)]=\frac{d}{dx}[f(x)^c]$

C. $\frac{d}{dx}[cf(x)]=\frac{dc}{dx}[f(x)]$

D. $\frac{d}{dx}[cf(x)]=c\frac{d}{dx}[f(x)]$

The curve $y^2-x+1=0$ has a tangent line at point (0, 1). ***Use it to answer questions 17 and 18***

17. Find the gradient of the tangent line.

A. 0

B. $\frac{1}{2}$

C. 1

D. 2

18. Find the equation of the tangent line.

A. $2x-y=1$

B. $2y-x=-1$

C. $2x=y+1$

D. $2y=x+1$

19. The result for $\int x^7+4x^{-6}dx$ gives _____

A. $\frac{1}{8}x^8+\frac{4}{5x^5}+C$

B. $\frac{1}{8}x^8+\frac{4}{5}x^5+C$

C. $\frac{1}{8}x^8-\frac{4}{5}x^5+C$

D. $\frac{1}{8}x^8-\frac{4}{5x^5}+C$

20. Which of the following best answers $\int_{-1}^{1} n^8-n^5dn$?

A. 0.2

B. $\frac{1}{50}$

C. $\frac{4}{18}$

D. 0

21. If $\int_{a}^{1} x^2=0$, find the value of a.

A. 0

B. 1

C. 2

D. 3

22. If $f(x) = x^2 - 1$ and $g(x) = 7x + 2$ then find $f'(x)g'(x)$.

A. $14x$

B. $2x(7x+2)$

C. $7x+2$

D. $2x$

A function is defined as $f(x) = \dfrac{x^2 - 3x + 2}{x - 1}$

Answer questions 23- 26 using this information.

23. At which of the following values of x will the function be discontinuous?

A. -1

B. 0

C. 1

D. 2

24. The limit of $f(x)$ as $x \to 1$ is_____

A. -1

B. 0

C. 1

D. ∞

25. Find $f(2)$.

A. -1

B. 0

C. 1

D. None of these

26. Which of the following is not true?

A. $\lim_{x \to -1} f(x) = -3$

B. $\lim_{x \to 0} f(x) = -2$

C. $\lim_{x \to 1} f(x) =$ undefined

D. All the above are true

27. Which of the following expressions truly represents $\int_a^b f(t)dt$?

A. $F(b) - F(a)$

B. $F(a) - F(t)$

C. $F(a) - F(b)$

D. $F(t) - F(a)$

28. In integration, $\int \cos x dx$ gives _____.

A. $-\cos x$

B. $\sin x$

C. $\cos x$

D. $-\sin x$

29. Solve $\dfrac{d}{dx}\left(\dfrac{1}{x}\right)$

A. $\ln x$

B. x^2

C. 1

D. $-\dfrac{1}{x^2}$

30. If $\int_4^m dx = 7$, find the value of m.

A. 3

B. 7

C. 9

D. 11

SECTION B (*30 marks*)

Answer QUESTION ONE and any other one in this section

1. (a) Sketch the graph of the function $f(x) = x^3 - 3x^2 + 1$ indicating the turning point(s), y-intercept (s) and x- intercept (s).

(b) Use implicit differentiation to find $\frac{d^2y}{dx^2}$ if $4x^2 - 2y^2 = 9$.

2. (a) Find $y'(x)$ if $y = \frac{x^3 + 2x^2 - 1}{x + 5}$

(b) Given that

$$h(x) = \begin{cases} \sqrt{4+x}, & \text{if } x > -4 \\ 8 + 2x, & \text{if } x < -4 \end{cases},$$

Determine whether the limit exists

3.(a) Evaluate $\int_0^1 (3 - 5x)^3 \, dx$

(b) Solve $\lim_{x \to \infty} \frac{22x^2 - 9x - 1}{8x^2 + 13x + 40}$