



HADHRAMOUT UNIVERSITY
COLLEGE OF COMPUTERS & INFORMATION TECHNOLOGY
MONTHLY EXAM

Academic year: 2022/2023
Day and Date: Wednesday 14/12/2022
Examiner: Somayah Saeed Binghouth
Time allowed: 1:00 hour

Exam Semester: First
Level: First
Department: IT
Subject: Differential Calculus

Q1: Choose the correct answer : (10 marks)

- a) The Range of $f(x) = x^2 + x + 1$ is
($[0, \infty[$, $[\frac{3}{4}, \infty[$, $[\frac{4}{3}, \infty[$)
- b) The angle $\frac{-13\pi}{9} \text{ rad}$ in degrees is (-260° , 260° , -240°)
- c) $f(x) = x^2 - x + 1$ is
(even , odd , neither even nor odd) function .
- d) $\sec \frac{5\pi}{3} =$ (-2 , $\frac{1}{2}$, 2)
- e) $\log_4 2 + \log_4 2 =$ (1 , 0 , 2)

Q2: Find the following limits : (10 marks)

- a) $\lim_{x \rightarrow 1} \left(\frac{x^2}{x-1} - \frac{1}{x-1} \right) = 2$
- b) $\lim_{x \rightarrow -\infty} \frac{4-7x}{2+3x} = \frac{-7}{3}$

Q3: Answer the following : (10 marks)

- a) Discuss the continuity of the function at the point a :

$$f(x) = \frac{\sqrt[3]{x}}{2x+1}, \quad a = 8$$

- b) Verify the identity :

$$\sec \theta - \cos \theta = \tan \theta \sin \theta$$

$$\frac{1}{\cos \theta} - \cos \theta = \frac{1 - \cos^2 \theta}{\cos \theta} = \frac{\sin^2 \theta}{\cos \theta} = \frac{\sin \theta}{\cos \theta} \times \sin \theta = \tan \theta \sin \theta$$

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Name: Muna Majidi Marai

information technology
IT / Level 1

30
30

Excellent

Q1:

10

a) $[\frac{3}{4}, \infty[$

b) -260

c) neither even nor odd

d) 2

e) 1

Q2:

10

a) $\lim_{x \rightarrow 1} \left(\frac{x^2}{x-1} - \frac{1}{x-1} \right)$

$= \frac{1-1}{0-0} = \frac{0}{0}$ (indeterminate form)

$= \lim_{x \rightarrow 1} \left(\frac{x^2-1}{x-1} \right) = \lim_{x \rightarrow 1} \frac{(x-1)(x+1)}{x-1}$

$= \lim_{x \rightarrow 1} (x+1) = 1+1 = 2$

b) $\lim_{x \rightarrow \infty} \frac{4-7x}{2+3x} = \frac{\infty}{-\infty}$ (indeterminate form)

$\lim_{x \rightarrow -\infty} \frac{\frac{4}{x} - \frac{7x}{x}}{\frac{2}{x} + \frac{3x}{x}} = \lim_{x \rightarrow -\infty} \frac{\frac{4}{x} - 7}{\frac{2}{x} + 3}$

$= \frac{0-7}{0+3} = \frac{-7}{3}$

Q3: 16 $\therefore f$ is continuous at $\mathbb{R} \setminus \{ \frac{1}{2} \}$ $\therefore f$ is continuous at 8

a) ~~f is a~~ $f(8) = \frac{\sqrt[3]{8}}{2 \times 8 + 1} = \frac{2}{17}$ 1

$$\lim_{x \rightarrow 8} \frac{\sqrt[3]{x}}{2x+1} = \frac{\sqrt[3]{8}}{2 \times 8 + 1} = \frac{2}{17}$$
1

$\therefore f(8)$ is defined

$\lim_{x \rightarrow 8} f(x)$ is exist

$$f(8) = \lim_{x \rightarrow 8} f(x)$$
1

$\therefore f(x)$ is continuous at 8 2

d) $\sec \theta - \cos \theta = \frac{1}{\cos \theta} - \cos \theta$ 1

$$= \frac{1 - \cos^2 \theta}{\cos \theta} = \frac{\sin^2 \theta}{\cos \theta} = \frac{\sin \theta \times \sin \theta}{\cos \theta}$$
1

$$= \tan \theta \sin \theta$$
1



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Subject: Differential Calculus
Examiner: Somayah Saeed Bin Ghouth
Day and Date: Tuesday 20/12/2022
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Q1: Choose the correct answer :

(10 marks)

- a) The domain of $f(x) = \frac{\sqrt{4-x^2}}{x-2}$ is ($[-2, 2]$, $[-2, 2[$, $] -2, 2]$)
- b) The angle $\frac{17\pi}{3}$ rad in degrees is (102° , 1200° , 1020°)
- c) $f(x) = 6x^5 - 4x^3 + 2x$ is
(even - odd - neither even nor odd) function .
- d) $\cos \frac{5\pi}{6} = (-\frac{\sqrt{3}}{2} , -\frac{1}{2} , \frac{\sqrt{3}}{2})$
- e) $a^2 \log_a x = (x , x^2 , 2x)$

Q2: Find the following limits :

(10 marks)

- a) $\lim_{x \rightarrow 4} \frac{x^2 - 16}{\sqrt{x} - 2} = \frac{(x-4)(x+4)}{\sqrt{x}-2} = \frac{(\sqrt{x}-2)(\sqrt{x}+2)(x+4)}{\sqrt{x}-2}$
- b) $\lim_{x \rightarrow \infty} \frac{5x^2 - 3x + 1}{2x^2 + 4x - 7} = \frac{5}{2}$

Q3: Answer the following :

(10 marks)

- a) Solve the equation : $\ln(y+1) = \ln(y-2) + \ln 2$ $y = 5$
- b) find the values of the constant k so that the function f is continuous at a :
- $$f(x) = \begin{cases} x^2 + k - 1 & , x \geq 0 \\ x + 1 & , x < 0 \end{cases} , a = 0$$

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1) 10

a) $[-2, 2[$

b) 1020°

c) odd

d) $-\frac{\sqrt{3}}{2}$

e) x^2

2) 10

a) $\lim_{x \rightarrow 4} \frac{x^2 - 16}{\sqrt{x} - 2} = \frac{16 - 16}{2 - 2} = \frac{0}{0}$ indeterminate limit

$\lim_{x \rightarrow 4} \frac{x^2 - 16}{\sqrt{x} - 2} = \lim_{x \rightarrow 4} \frac{(x - 4)(x + 4)}{\sqrt{x} - 2} = \lim_{x \rightarrow 4} \frac{(\sqrt{x} - 2)(\sqrt{x} + 2)(x + 4)}{(\sqrt{x} - 2)}$

$= \lim_{x \rightarrow 4} (\sqrt{x} + 2)(x + 4) = (2 + 2)(4 + 4) = 4 \times 8 = 32$

b) $\lim_{x \rightarrow \infty} \frac{5x^2 - 3x + 1}{2x^2 + 4x - 7} = \frac{5(\infty)^2 - 3(\infty) + 1}{2(\infty)^2 + 4(\infty) - 7} = \frac{\infty}{\infty}$ indeterminate

$\lim_{x \rightarrow \infty} \frac{5x^2 - 3x + 1}{2x^2 + 4x - 7} = \lim_{x \rightarrow \infty} \frac{\frac{5x^2}{x^2} - \frac{3x}{x^2} + \frac{1}{x^2}}{\frac{2x^2}{x^2} + \frac{4x}{x^2} - \frac{7}{x^2}} = \lim_{x \rightarrow \infty} \frac{5 - \frac{3}{x} + \frac{1}{x^2}}{2 + \frac{4}{x} - \frac{7}{x^2}}$

$= \frac{5 - 0 + 0}{2 + 0 - 0} = \frac{5}{2}$

10

23) a) $\ln(y+1) = \ln(y-2) + \ln 2 \Rightarrow \ln(y+1) = \ln(y-2)(2)$
 $\Rightarrow \ln(y+1) = \ln(2y-4) \Rightarrow y+1 = 2y-4 \Rightarrow y = 1+4 \Rightarrow y = 5$

b) $\begin{cases} x^2 + k - 1 & , x \geq 0 \\ x + 1 & , x < 0 \end{cases} , a = 0$

Sol: $f(0) = 0 + k - 1 = k - 1$

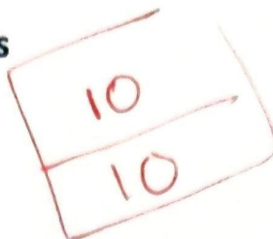
$\therefore f$ is continuous at a

$\therefore f(0) = \lim_{x \rightarrow 0^+} f(x) = \lim_{x \rightarrow 0^-} f(x)$ $\lim_{x \rightarrow 0^-} x + 1 = 1$

$\therefore f(0) = \lim_{x \rightarrow 0} f(x) \Rightarrow k - 1 = 1 \Rightarrow k = 2$

Quiz in Calculus

(b)

Find $f'(x)$:

1. $f(x) = \sqrt{2}$

2. $f(x) = x - x^2 \cos x$

3. $f(x) = x^2 \ln x$

4. $f(x) = 3^{\sqrt{\sin x}}$

5. $f(x) = \cos(x+1)^2$

6. $f(x) = (2x^4 - 5x^3 + x^2 - 4x + 1)^7$

1) $f'(x) = 0$ ✓ (2)

2) $f'(x) = 1 - (2x \cos x + x^2 (-\sin x))$

$f'(x) = 1 - 2x \cos x + x^2 \sin x$ ✓ (2)

3) $f'(x) = 2x \ln x + \frac{x^2}{x} = 2x \ln x + x$ ✓ (2)

4) $f'(x) = 3^{\sqrt{\sin x}} \cdot \ln 3 \cdot \frac{\cos}{2\sqrt{\sin x}}$ ✓ (2)

5) $f'(x) = 2(x+1) \cdot -\sin(x+1)^2$

$= -2(x+1) \sin(x+1)^2$ ✓ (2)

6) $f'(x) = 7(2x^4 - 5x^3 + x^2 - 4x + 1)^6 (8x^3 - 15x^2 + 2x - 4)$

المستوى : الأول

القسم : IT

الاسم : Nadiya Bin Sloom

Quiz in Calculus

(a)



Find $f'(x)$:

1. $f(x) = \sqrt{5}$

2. $f(x) = x^2 + \frac{1}{x^2}$

3. $f(x) = (2x^3 - 1)\ln x$

4. $f(x) = 2^{\sqrt{x^2+2x-1}}$

5. $f(x) = \sin(3x+1)^3$

6. $f(x) = (2x^4 - 5x^3 + x^2 - 4x + 1)^7$

① $f'(x) = 0$ ✓ ②

② $f'(x) = 2x + \left(\frac{-2x}{x^2}\right) = 2x - \frac{2x}{x^2} = 2x - \frac{2}{x}$ ✓ ②

③ $f'(x) = 6x^2(\ln x) + (2x^3 - 1)$ ✓ ②

④ $f'(x) = 2^{\sqrt{x^2+2x-1}} \cdot \ln 2 \cdot (2x+2)$ ✓ ②

⑤ $f'(x) = 3 \sin^2(3x+1) \cdot \cos(3x+1) \cdot 3$

$= 9 \sin^2(3x+1) \cos(3x+1)$ ✓ ②