

King Fahd University of Petroleum and Minerals

Exam 1 MATH 106- Semester 181

Instructor: J.D. Audu

Date: 10/10/2018

Time: 7pm-9pm

Name..... ID.....

Section #.....Serial #.....

Instructions

Show all your work clearly

Use of calculator or any electronic device is not allowed

Question No.	Points	Points Obtained
Q1	20	
Q2	20	
Q3	20	
Q4	40	
Total	100	

Question 1 (20 points) Evaluate the following limits if it exists, if it does not exist state why. Use $+\infty$ or $-\infty$ where appropriate.

$$(a) \lim_{x \rightarrow 2} \frac{(x-1)|x-2|}{x^2-3x+2}$$

5points

$$(b) \lim_{x \rightarrow \infty} \sqrt{x^2 + x} - x$$

5points

$$(c) \lim_{w \rightarrow 1} \frac{\sqrt{w}-1}{w-1}$$

5points

$$(d) \lim_{x \rightarrow 0^-} \left(\frac{1}{x^2} - \frac{1}{x^3} \right)$$

5points

Question 2 (20points)

(a) Let $f(x) = \begin{cases} m + nx, & \text{if } x > 2 \\ 3 & , \text{if } x = 2 \\ n - mx^2, & \text{if } x < 2 \end{cases}$, determine the values of the constants

m and n that makes f continuous at $x=2$.

10points

(b) Use the definition of derivatives to find $f'(x)$ for the function $f(x) = \frac{1}{\sqrt{x}}$.

5points

(c) The position function of a moving object is $s(t) = 3t^4 - t^{7/4}$, where t is in seconds and s in meters.

i. Find the average velocity over the interval $[0, 1]$

2points

ii. Find the velocity at $t=0$.

3points

Question 4 (Multiple Choice)Circle the correct option. **5points** for each correct answer.

1. $\ln(xy) + xy^2 + y\sqrt{x} = 2$, find $y'(1,1)$.

A. $\frac{-5}{8}$

B. -2

C. $\frac{4}{7}$

D. $\frac{-4}{7}$

E. $\frac{7}{8}$

2. Find an equation of the tangent line to the curve $y = \frac{\sqrt{7x+2}}{x+1}$ at the point $(1, \frac{3}{2})$.

A. $y = -\frac{8}{6}x + \frac{5}{3}$

B. $y = \frac{1}{3}x + \frac{8}{3}$

C. $y = -\frac{3}{4}x + 2$

D. $y = -3x + 4$

E. $y = -\frac{1}{6}x + \frac{5}{3}$

3. If $y = \frac{1}{\sqrt{2+\sqrt{x}}}$, then $y' =$

A. $-\frac{1}{2}x^{-1/2}(2 + \sqrt{x})^{-3/2}$

B. $\frac{1}{4}x^{-1/2}(2 + \sqrt{x})^{-3/2}$

C. $-\frac{1}{4}x^{-1/2}(2 + \sqrt{x})^{-3/2}$

D. $-\frac{1}{4}x^{-1/2}(2 + \sqrt{x})^{-1/2}$

E. $\frac{1}{4}x^{-3/2}(2 + \sqrt{x})^{-1/2}$

4. If $f(x) = 3^{x^2} + e^2$ then $\frac{d^2f}{dx^2} =$

A. $3^{2x} + 2e$

B. $3^{x^2} 2x \ln 3$

C. $2 \ln 3 3^{x^2} (1 + 2x^2 \ln 3)$

D. $x^2 3^x \ln 3 + 3^x 2x$

E. 11

5. If $y = (5u + 6)^3$ and $u = (x^2 + 1)^4$, find $\frac{dy}{dx}$ when $x = 0$.

A. 132

B. 0

C. 128

D. 233

E. 6

6. Suppose $C = f(q)$ is the total cost of producing q units of product and $R = f(q)$ is the total revenue generated from selling q units of the product at price p dollars per unit. Which of following is **incorrect**?

A. The marginal cost $= \frac{dC}{dq}$

B. Average revenue $r = \frac{R}{q}$

C. Profit function $P = R - C$

D. Relative rate of change of the marginal revenue $= \frac{\frac{dr}{dq}}{r}$

E. Percentage rate of change of the marginal cost $= \frac{\frac{dC}{dq}}{C} \times 100$

7. If the demand equation for a manufacturer product is $p = \frac{\log_3^q}{q}$, where p is in dollars, calculate the marginal revenue when the quantity $q = 4$.

A. 3

B. $\ln 3$

C. $\frac{4}{\ln 3}$

D. $\frac{1}{4\ln 3}$

E. \log_3^4

8. $y = \left(\frac{3}{x^2}\right)^{x^2}$, find the relative rate of change of y when $x = \sqrt{3}$.

A. $-2\sqrt{3}$

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

C. $\sqrt{3}$

D. 9

E. 3