King Fahd University of Petroleum and Minerals Department of Mathematics Math 101 Major Exam II 233 July 25, 2024 Net Time Allowed: 90 Minutes

# USE THIS AS A TEMPLATE

Write your questions, once you are satisfied upload this file.

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MASTER

1. The value of c that satisfies Rolle's Theorem when applied to  $f(x) = (x-2)(x+3)^2$  on [-3,2] is equal to

(a) 
$$\frac{1}{3}$$
  
(b)  $\frac{1}{2}$   
(c)  $-3$   
(d) 2  
(e)  $-\frac{1}{3}$ 

Question 17 / Review Exercises Chapter 4 Page 278 Section 4.2 2. The value of c that satisfies the Mean Value Theorem when applied to  $f(x) = x - \cos x$  on  $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$  is equal to

(a) 0  
(b) 
$$\frac{\pi}{6}$$
  
(c)  $\frac{\pi}{3}$   
(d)  $-\frac{\pi}{4}$   
(e)  $-\frac{\pi}{3}$ 

## Question 19 / Section 4.1 Page 211

- 3. If x = c is a critical number of the function  $f(x) = \sin^2 x + \cos x$  on  $(0, 2\pi)$ , then the sum of all possible values of c is
  - (a)  $3\pi$
  - (b)  $2\pi$
  - (c)  $\pi$
  - (d)  $\frac{5\pi}{3}$

  - (e)  $\frac{2\pi}{3}$

### Question 31 / Section 4.1 Page 211

- 4. If M and m are the absolute maximum and absolute minimum respectively of the function  $f(x) = 3x^{2/3} - 2x$  on [-1, 1], then M + m =
  - (a) 5
  - (b) 2
  - (c) 4

  - (d) 7
  - (e) 3

#### Question 13 / Section 3.8 Page 198

5. Newton's Method is used to approximate a zero of the function  $f(x) = x - e^{-x}$ . If we choose  $x_1 = 0$ , then  $x_2 =$ 

(a)  $\frac{1}{2}$ (b)  $-\frac{1}{2}$ (c) 1 (d) -1(e) 2

Question 119 / Review Exercises Chapter 3 Page 202 Section 3.7

- 6. A point moves along the curve  $y = \sqrt{x}$  in such away that the y-component of the position of the point is increasing at a rate of 2 units per second. At what rate is the x-component changing when x = 4?
  - (a) increasing at a rate of 8 units per second
  - (b) decreasing at a rate of 8 units per second
  - (c) increasing at a rate of  $\frac{1}{2}$  unit per second
  - (d) decreasing at a rate of  $\frac{1}{2}$  unit per second

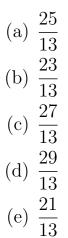
  - (e) increasing at a rate of 1 unit per second

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### Question 26 / Section 3.7 Page 191

- 7. An airplane is flying at an altitude of 5 miles and passes directly over a radar antenna. When the distance between the plane and the radar is 10 miles, the radar detects that the distance between the radar and the plane is changing at a rate of 240 miles per hour. What is the speed of the plane?
  - (a)  $160\sqrt{3}$
  - (b)  $320\sqrt{3}$
  - (c) 160
  - (d) 320
  - (e) 480

Example 4 / Section 3.6 Page 180 8. If  $y = \arctan(3x) + \arcsin(\sqrt{x})$ , then  $\frac{dy}{dx}|_{x=\frac{1}{2}} =$ 



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Question 111 / Review Exercises Chapter (3 page 202 Section 3.6  
9. If 
$$f(x) = \tan x, -\frac{\pi}{4} \le x \le \frac{\pi}{4}$$
, then  $(f^{-1})' \begin{pmatrix} 3\sqrt{3} \\ \sqrt{3} \\ 3 \end{pmatrix} =$ 

(a)  $\frac{3}{4}$ (b)  $\frac{1}{4}$ (c) 1 (d)  $\frac{1}{2}$ (e)  $\frac{5}{4}$ 

Question 51 / Section 3.5 Page 176 10. The slope of the graph of the relation  $x + y - 1 = \ln(x^2 + y^2)$  at the point (1,0) is

- (a) 1
- (b) 2
- (c) -1
- (d) -2
- (e) 0

Question 63 / Section 3.5 Page 176

11. If y = Ax + B is the equation of the normal line to the circle  $x^2 + y^2 = 25$  at the point (4,3), then A + B =

(a) 
$$\frac{3}{4}$$
  
(b)  $\frac{-3}{4}$   
(c)  $\frac{4}{3}$   
(d)  $\frac{-4}{3}$   
(e)  $\frac{1}{5}$ 

Question 80 / Section 3.5 Page 176 12. If  $y = (\ln x)^{\ln x}$ , x > 1, then y'(e) =

(a) 
$$\frac{1}{e}$$
  
(b)  $e$   
(c)  $e^2$   
(d) 1  
(e)  $\frac{1}{e^2}$ 

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Question 129 / Section 3.4 Page 166 13. If  $h(x) = \frac{1}{9}(3x+1)^3$ , then h''(1) =

- (a) 24
- (b) 22
- (c) 26
- (d) 20
- (e) 28

Question 30 / Section 
$$\frac{3}{2}^{4}$$
 Page 164  
14. If  $g(x) = \left(\frac{3x^2 - 2}{2x + 3}\right)^{\frac{3}{2}}$ , then  $g'(0) =$ 

- (a) 3
- (b) 4
- (c) 2
- (-) (1) 0
- (d) 0
- (e) 1