King Fahd University of Petroleum and Minerals
Department of Mathematics
Math 101
Exam I
223
July 12, 2023
Net Time Allowed: 120 Minutes

MASTER VERSION

Q33/ Section 2.2

1. Let $f(x) = \begin{cases} x^2, & x \leq 2 \\ 8 - 2x, & 2 < x < 4 \\ 4, & x \geq 4 \end{cases}$

   The sum of all values of c for which $\lim_{x \to c} f(x)$ does not exist is

   (a) 4 _____ (correct)

   (b) 6

   (c) 2

   (d) 0

   (e) -4

Questions 85, 86 / Section 2.3

2. $\lim_{x \to 1} \dfrac{\ln x}{x - 1} + \lim_{x \to \ln 2} \dfrac{e^{3x} - 8}{e^{2x} - 4} =$

   (a) 4 _____ (correct)

   (b) 5

   (c) 3

   (d) 2

   (e) 6

Question 127/ Section 2.3

3. $\lim_{x\to 0} \dfrac{\sec x - 1}{x^2} =$

(a) $\dfrac{1}{2}$ (correct)

(b) $-\dfrac{1}{2}$

(c) 0

(d) 1

(e) -1

Question 65/ Section 2.4

4. If the function $f(x) = \begin{cases} ae^{x-1} + 3, & x < 1 \\ \tan^{-1}(x-1) + 2, & x \geq 1 \end{cases}$ is continuous on the entire real number line, then $a =$

(a) -1 (correct)

(b) 1

(c) -2

(d) 2

(e) 0

Question 79/ Review Chapter 2

5. The sum of all $k's$ for which $x = k$ is a vertical asymptote for the function $f(x) = \sec \frac{\pi x}{2}$, on the interval $(0, 6)$ is

(a) 9 _____ (correct)

(b) 10

(c) 11

(d) 8

(e) 7

Question 65/ Review Chapter 2

6. The function $f(x) = 2e^{[\![x]\!]/4}$ has a nonremovable discontinuity at $x =$

(a) 1 _____ (correct)

(b) $\frac{1}{2}$

(c) $-\frac{1}{2}$

(d) $\frac{3}{2}$

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

Question 11/ Problem Solving Chapter 2

7. $\lim_{x\to 1}(\llbracket x\rrbracket + \llbracket -x\rrbracket) =$

(a) -1 (correct)

(b) 1

(c) 0

(d) 2

(e) does not exist

Question 51/ Section 4.5

8. $\lim_{x\to -\infty}(3x + \sqrt{9x^2 - x}) =$

(a) $\frac{1}{6}$ (correct)

(b) $\frac{-1}{6}$

(c) $\frac{1}{3}$

(d) $\frac{-1}{3}$

(e) $\frac{1}{4}$

Question 53/ Section 3.1

9. If the tangent line to the graph of $y = g(x)$ at the point $(4, 5)$ passes through the point $(7, 0)$, then $g(4) + g'(4) =$

(a) $\frac{10}{3}$ (correct)

(b) 5

(c) 12

(d) 0

(e) $\frac{7}{3}$

Question 97/ Section 3.1

10. If $f(x) = \begin{cases} x^2 \sin \frac{1}{x}, & x \neq 0 \\ 0, & x = 0, \end{cases}$ then $f'(0)$

(a) equals zero (correct)

(b) does not exist

(c) equals 1

(d) equals -1

(e) equals π

Question 70/ Section 3.2

11. If the graph of the function $f(x) = \sqrt{3}x + 2\cos x$, $0 \leq x < 2\pi$ has a horizontal tangent line at $x = a$, then the sum of all $a's$ is

(a) π (correct)

(b) 2π

(c) 0

(d) 3π

(e) 4π

Question 74/ Section 3.2

12. If the line $y = x + 4$ is tangent to the graph of the function $f(x) = k\sqrt{x}$, then $k =$

(a) 4 (correct)

(b) 0

(c) -4

(d) 2

(e) -2

Question 118/ Section 3.2

13. If $f(x) = \begin{cases} \cos x, & x < 0 \\ ax + b, , & x \geq 0, \end{cases}$ is differentiable everywhere, then $a + b =$

(a) 1 (correct)

(b) 0

(c) -1

(d) 2

(e) -2

Question 41/ Section 3.3

14. If $f(x) = (2x^3 + 5x)(x - 3)(x + 2)$, then $f'(0) =$

(a) -30 (correct)

(b) -20

(c) -10

(d) -40

(e) -50

Question 74/ Section 3.3

15. If $f(x) = \dfrac{e^x}{x+4}$, then the equation of the tangent line to the graph of f at the point $\left(0, \dfrac{1}{4}\right)$ is $y =$

(a) $\dfrac{3}{16}x + \dfrac{1}{4}$ (correct)

(b) $\dfrac{1}{16}x + \dfrac{1}{4}$

(c) $\dfrac{5}{16}x + \dfrac{1}{4}$

(d) $-\dfrac{1}{16}x + \dfrac{1}{4}$

(e) $\dfrac{7}{16}x + \dfrac{1}{4}$

Question 111/ Section 3.3

16. If $f''(x) = -\sin x$, then $f^{(8)}\left(\dfrac{\pi}{2}\right) =$

(a) 1 (correct)

(b) -1

(c) 0

(d) π

(e) $-\pi$

Question 43/ Section 4.5

17. The product of all $k's$ for which $y = k$ is a horizontal asymptote for the function $f(x) = \dfrac{|x|}{x+1}$ is

(a) -1 (correct)

(b) 1

(c) 0

(d) -2

(e) 2

Question 47/ Section 3.3

18. If $y = -e^x + \tan x$, then $y'(0) =$

(a) 0 (correct)

(b) 1

(c) -1

(d) 2

(e) -2