Math 75A   Maria Nogin
Practice Final

- This practice final covers all major topics, however, by far not all types of problems that may appear on the Final Exam. You are strongly encouraged to do this practice final, review all three tests, quizzes, and homework assignments (both on-line and from the book). Correct answers are given at the end of the file so that you can check your answers. To receive extra credit (8 points per problem), show your work/provide justifications for all problems. (Note: 400 points for 50 problems is equivalent to 4 homework assignments, or 1/3 of each test, or 5% of your total semester score.) Scan/save your work and either upload to Canvas or send by email to mnogin@csufresno.edu.

- The actual Final Exam will consist of two parts. Part I will contain 10 multiple choice problems, each worth 80 points, and only your answers will be graded. Part II will contain 10 problems, each worth 160 points, for which you will have to show your work.

- You will have 2 hours to complete the exam.

- The final exam counts as 30 percent of your grade.

- You will need a pencil or a pen, and a few sheets of paper.

1. If the graph of $f(x)$ passes through points $(5,3)$, $(-3,2)$, $(3,4)$, and $(0,3)$, then what is the value of $f(3)$?

 (a) 0

 (b) 4

 (c) 5

 (d) Undefined

 (e) Cannot be determined (the given information is not sufficient)

2. Let $f(x) = \begin{cases} -x+3 & \text{if} & x < 2, \\ 4 & \text{if} & x = 2, \\ x^2 - 2 & \text{if} & x > 2. \end{cases}$ Find $\lim\limits_{x \to -2^+} f(x)$.

 (a) -6

 (b) 2

 (c) 4

 (d) 5

 (e) Does not exist

3. Does the point $(-4, 2)$ lie on, above, or below the line $y = -\dfrac{1}{3}x + 1$?

   (a) On the line

   (b) Below the line

   (c) Above the line

   (d) Cannot be determined (the given information is not sufficient)

   (e) None of the above

4. Find an equation of the tangent line to $y = \ln x + x^2$ at $x = 2$.

   (a) $y = 0.5x + \ln 2 + 3$

   (b) $y = 2.5x + \ln 2 - 1$

   (c) $y = 2.5x + \ln 2 - 5$

   (d) $y = 4.5x + \ln 2 + 3$

   (e) $y = 4.5x + \ln 2 - 5$

5. The domain of the function $f(x) = \sqrt{\dfrac{1 - x}{1 + x}}$ is the set of all real numbers x such that:

   (a) $x \neq -1$

   (b) $x > 1$

   (c) $-1 < x$

   (d) $x \geq 1$

   (e) $-1 < x \leq 1$

6. Evaluate the limit: $\lim\limits_{x \to 3} \dfrac{x^2 - 1}{x^2 - 2x - 3}$.

   (a) 1

   (b) 3

   (c) $-\infty$

   (d) ∞

   (e) None of the above

7. If $f(x) = \dfrac{1}{x^2}$ and $g(x) = \sqrt{x}$, then the domain of $f \circ g$ is

    (a) $(-\infty, \infty)$

    (b) $(0, \infty)$

    (c) $[0, \infty)$

    (d) $(-\infty, 0) \cup (0, \infty)$

    (e) None of the above

8. If $f(x) = 3e^{4x+2} + e^3$, find $f'(0)$.

    (a) $3e^2$

    (b) $6e^2$

    (c) $12e^2$

    (d) $15e^2$

    (e) None of the above

9. Which of the following functions is neither even nor odd?

    (a) $5 - x^2$

    (b) $2x + 7x^5$

    (c) $\sin x + 4x$

    (d) $\sin x + x^2$

    (e) $\cos x + 5$

10. Use implicit differentiation to find the slope of the tangent line to the curve
$xy + 11 = x^3 + y^2$ at the point $(2, 3)$.

    (a) -2.25

    (b) -2

    (c) -1.75

    (d) -1.5

    (e) -1.25

11. The graph of $f(x) = \ln x$ is shifted 3 units upward and 2 units to the right. Which of the following is an equation of the new curve?

    (a) $y = \ln(x - 3) + 2$

    (b) $y = \ln(x + 3) - 2$

    (c) $y = \ln(x + 2) + 3$

    (d) $y = \ln(x - 2) + 3$

    (e) $y = \ln(x + 2) - 3$

12. Evaluate $\lim\limits_{x \to 2} \dfrac{2x^2 - 5x + 2}{x^2 - x - 2}$.

    (a) 0

    (b) 1

    (c) 2

    (d) ∞

    (e) $-\infty$

13. Use the definition of the derivative to find $f'(x)$ for $f(x) = 3x^2 + x - 5$.

    (a) $f'(x) = 3x + 1$

    (b) $f'(x) = 3x - 4$

    (c) $f'(x) = 6x + 1$

    (d) $f'(x) = 6x - 4$

    (e) None of the above

14. Evaluate $\lim\limits_{x \to 7} \dfrac{\sqrt{x + 2} - 3}{x - 7}$.

    (a) 0

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

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

    (d) 1

    (e) ∞

15. Find the inverse function of $f(x) = \dfrac{x+2}{x}$.

    (a) $f^{-1}(x) = -\dfrac{x+2}{x}$

    (b) $f^{-1}(x) = \dfrac{x}{x+2}$

    (c) $f^{-1}(x) = \dfrac{2}{x-1}$

    (d) $f^{-1}(x) = \dfrac{2}{x+1}$

    (e) None of the above

16. Evaluate: $\arcsin\left(-\frac{1}{2}\right)$.

    (a) $-\dfrac{\pi}{3}$

    (b) $-\dfrac{\pi}{6}$

    (c) $\dfrac{4\pi}{3}$

    (d) $\dfrac{5\pi}{6}$

    (e) $\dfrac{7\pi}{6}$

17. Find all vertical asymptotes for the function $f(x) = \dfrac{3x - x^2}{x^2 - 9}$.

    (a) $x = -3$

    (b) $x = 3$

    (c) $x = 3$, $x = -3$

    (d) $y = 3$, $y = -3$

    (e) $x = 3$, $y = 3$

18. Find the slope of the line that passes through points $(-2, -1)$ and $(4, 1)$.

    (a) $-\dfrac{1}{3}$

    (b) $\dfrac{1}{3}$

    (c) -3

    (d) 3

    (e) None of the above

19. Find the value of k for which the function $f(x) = \begin{cases} \dfrac{x-9}{\sqrt{x}-3} & \text{if } x \neq 9 \\ k & \text{if } x = 9 \end{cases}$ is continuous

at $x = 9$:

   (a) 0

   (b) −3

   (c) 3

   (d) 9

   (e) 6

20. Find $\dfrac{d^2}{dx^2}\left(\dfrac{x^2+1}{x}\right)$.

   (a) It is undefined

   (b) $\dfrac{2}{x^3}$

   (c) $-2x^{-3}$

   (d) $1 - x^{-2}$

   (e) None of the above

21. Which of the following intervals contains a root of $x^3 + x - 5 = 0$?

   (a) $[-2, -1]$

   (b) $[-1, 0]$

   (c) $[0, 1]$

   (d) $[1, 2]$

   (e) $[2, 3]$

22. A particle moves along a straight line with equation of motion $s(t) = \sqrt{t+1}$. Find its average velocity over the time interval $[0, 3]$.

   (a) $\dfrac{1}{3}$

   (b) $\dfrac{1}{\sqrt{3}}$

   (c) $\dfrac{14}{9}$

   (d) 1

   (e) $-\dfrac{1}{12}$

23. Simplify: $\dfrac{2^2 \cdot 8^{2/3}}{4^{1/2}}$

    (a) 1

    (b) 2

    (c) 4

    (d) 8

    (e) None of the above

24. Rewrite the function $\left(5x^2 + \dfrac{1}{2x^3} + \dfrac{3}{\sqrt[3]{x}} \right) \sqrt[3]{x^7}$ as a sum where each term is a constant times a power of x.

    (a) $5x^{17/7} - \dfrac{1}{2}x^{18/7} + 3x^7$

    (b) $5x^{17/7} + \dfrac{1}{2}x^{-18/7} + 3x^{2/21}$

    (c) $5x^{13/3} + \dfrac{1}{2}x^{-2/3} + 3x^2$

    (d) $5x^{13/3} - \dfrac{1}{2}x^{2/3} + 3x^2$

    (e) None of the above

25. Find the slope of the tangent line to the curve $y = 2\cos x - \sin x$ at $x = 4\pi/3$.

    (a) $\dfrac{\sqrt{3}}{2}$

    (b) $\dfrac{\sqrt{3}+1}{2}$

    (c) $\dfrac{2\sqrt{3}-1}{2}$

    (d) $\dfrac{2\sqrt{3}+1}{2}$

    (e) None of the above

26. Find all values of x at which the tangent line to the curve $y = \dfrac{(x-3)^4}{x^2-2}$ is horizontal.

    (a) $\sqrt{2}, 3$

    (b) $0, 3$

    (c) $-4, 1, 3$

    (d) $-\sqrt{2}, \sqrt{2}$

    (e) $-4, 0, 2$

27. If $f(x) = (\sqrt[3]{x})^2$, then $\dfrac{df(x)}{dx} =$

   (a) $\dfrac{2}{3}x^{5/3}$

   (b) $\dfrac{2}{3x^{1/3}}$

   (c) $\dfrac{2}{3x^{-1/3}}$

   (d) $\dfrac{3}{5}x^{5/3}$

   (e) $\dfrac{3}{2}\sqrt{x}$

28. Which of the following statements is false about the function $f(x) = \ln x$?

   (a) It is increasing.

   (b) It is one-to-one.

   (c) It is continuous everywhere in its domain.

   (d) It is defined for all real numbers x.

   (e) Its derivative is positive everywhere in its domain.

29. Find the derivative of $\sin(4x)$ at $x = \dfrac{\pi}{6}$.

   (a) $-2\sqrt{3}$

   (b) -2

   (c) $\dfrac{\sqrt{3}}{2}$

   (d) $4\sqrt{3}$

   (e) None of the above

30. Solve the equation: $4 = \ln(2 - x)$.

   (a) $\dfrac{e}{4}$

   (b) $\dfrac{e^4}{2}$

   (c) $2 - e^4$

   (d) $4 - e^2$

   (e) None of the above

31. If $f(x) = \pi^3 + \dfrac{x}{\sqrt{x}}$, then $f'(x) =$

    (a) $3\pi^2 + \dfrac{1}{\frac{1}{2}x^{-1/2}}$

    (b) $3\pi^2 + \dfrac{1}{2\sqrt{x}}$

    (c) $\dfrac{1}{2\sqrt{x}}$

    (d) $\dfrac{\sqrt{x} - x\frac{1}{2}x^{-1/2}}{(\sqrt{x})^2}$

    (e) $3\pi^2 + \dfrac{\sqrt{x} - x\frac{1}{2}x^{-1/2}}{(\sqrt{x})^2}$

32. If a ball is given a push so that it has an initial velocity of 2 m/s down a certain inclined plane, then the distance it has rolled after t seconds is $s = 2t + t^2$. How long does it take for the velocity to reach 24 m/s?

    (a) 2 seconds

    (b) 4 seconds

    (c) 5 seconds

    (d) 11 seconds

    (e) 12 seconds

33. Evaluate the limit: $\displaystyle\lim_{x \to 5^-} \dfrac{x^2 - 5}{x^2 - 6x + 5}$

    (a) 0

    (b) $\dfrac{1}{3}$

    (c) $-\infty$

    (d) ∞

    (e) None of the above

34. Simplify the expression: $\dfrac{1 - \sin^2 x}{\cos x}(\sin x \tan x + \cos x)$

    (a) 1

    (b) $\sin x$

    (c) $\cos x$

    (d) $\tan x$

    (e) None of the above

35. Which of the following functions defined from $(-\infty, \infty)$ to $(-\infty, \infty)$ has an inverse?

   (a) $f(x) = x^2$

   (b) $f(x) = |x|$

   (c) $f(x) = x^3$

   (d) $f(x) = e^x$

   (e) None of the above

36. Which of the following is an equation of the circle that has center at $(-1, -2)$ and passes through $(-4, -6)$?

   (a) $(x + 1)^2 + (y + 2)^2 = 25$

   (b) $(x - 1)^2 + (y - 2)^2 = 5$

   (c) $(x + 4)^2 + (y + 6)^2 = 25$

   (d) $(x - 4)^2 + (y - 6)^2 = 5$

   (e) None of the above

37. Evaluate $\lim\limits_{x \to 0^+} \ln(x)$.

   (a) $-\infty$

   (b) 0

   (c) 1

   (d) ∞

   (e) Does not exist

38. If $F(x) = f(g(x))$, $f(1) = 0$, $f'(1) = 5$, $f'(2) = -4$, $g(1) = 2$, $g'(0) = -6$, and $g'(1) = 3$, then $F'(1) =$

   (a) -30

   (b) -24

   (c) -12

   (d) 0

   (e) 15

39. Let $f(x) = \begin{cases} x & \text{if} & x < 0 \\ 2x & \text{if} & 0 \le x \le 2 \\ 4 - x & \text{if} & x > 2 \end{cases}$

Find all values of x where $f(x)$ is discontinuous.

(a) 0

(b) 2

(c) 4

(d) 0 and 2

(e) None of the above

40. If $y = \cos(\cot x)$, then $\dfrac{dy}{dx} =$

(a) $-\sin(\cot x)$

(b) $-\sin(-\csc x \cot x)$

(c) $-\sin x \cot x - \cos x \csc x \cot x$

(d) $\dfrac{\cot x \cos x}{\sin x}$

(e) $\dfrac{\sin(\cot x)}{\sin^2 x}$

41. Convert $105°$ to radians:

(a) $-\dfrac{7}{12}$

(b) $\dfrac{7}{12}\pi$

(c) $-\dfrac{105}{180}\pi$

(d) $\dfrac{105}{180}$

(e) None of the above

42. If $f(x) = \dfrac{2^x}{\ln 2}$, find $f'(-1)$.

(a) 0

(b) 1

(c) $\ln 2$

(d) $\dfrac{1}{2\ln 2}$

(e) $\dfrac{1}{2}$

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43. Find the domain of the function $f(x) = \sqrt{x^2 + 1}$.

    (a) $(-1, \infty)$

    (b) $[-1, \infty)$

    (c) $(-\infty, -1] \cup [1, \infty)$

    (d) $(-\infty, -1) \cup (1, \infty)$

    (e) None of the above

44. Find the inverse function of $f(x) = 0.5x - 2$

    (a) $f^{-1}(x) = 2x + 4$

    (b) $f^{-1}(x) = 2x - 4$

    (c) $f^{-1}(x) = 1 + 2x$

    (d) $f^{-1}(x) = 1 - 2x$

    (e) None of the above

45. Let $f = x^2 - 5$ and $g(x) = 2x + 3$. Find $(f \circ g)(x)$.

    (a) $2x^3 + 3x^2 - 10x - 15$

    (b) $2x^2 - 2$

    (c) $4x^2 + 14$

    (d) $4x^2 + 12x + 4$

    (e) None of the above

46. Evaluate: $\tan^{-1}\left(\tan\left(\frac{7\pi}{10}\right)\right)$.

    (a) $\dfrac{-2\pi}{10}$

    (b) $\dfrac{2\pi}{10}$

    (c) $\dfrac{-7\pi}{10}$

    (d) $\dfrac{7\pi}{10}$

    (e) $\dfrac{-3\pi}{10}$

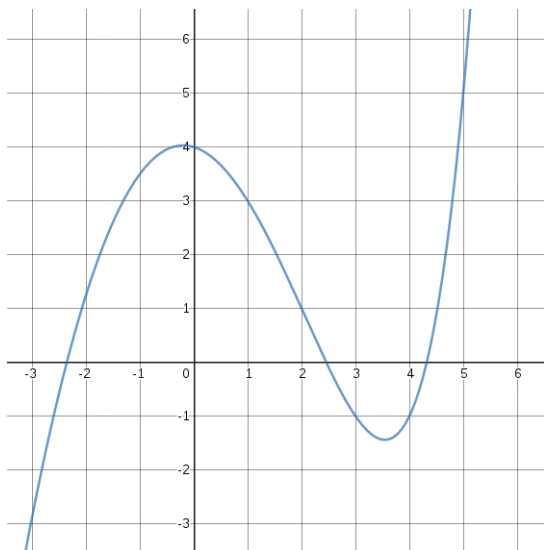47. Which of the following points lies on the graph of $f(x) = x^2 - 4x - 4$?

    (a) $(0, -3)$

    (b) $(-1, 3)$

    (c) $(-2, 0)$

    (d) $(-3, 17)$

    (e) None of the above

48. What are the domain and range of $\cos^{-1}(x)$?

    (a) Domain: $[-\pi/2, \pi/2]$, Range: $[-1, 1]$.

    (b) Domain: $(-\pi/2, \pi/2)$, Range: $[-1, 1]$.

    (c) Domain: $[0, \pi]$, Range: $[-1, 1]$.

    (d) Domain: $[-1, 1]$, Range: $(-\pi/2, \pi/2)$.

    (e) Domain: $[-1, 1]$, Range: $[0, \pi]$.

49. The graph of $y = f(x)$ is given. Sketch the graph of $y = f(2x - 3)$.

50. Sketch the graph of a function that satisfies all of the given conditions: $\lim_{x \to -2} f(x) = \infty$, $f(0)$ is undefined, $\lim_{x \to 0} f(x) = 2$, $f(2) = 1$, $\lim_{x \to 2} f(x)$ does not exist.

Answers

1. b	2. d	3. b	4. e	5. e	6. e	7. b	8. c	9. d	10. a
11. d	12. b	13. c	14. b	15. c	16. b	17. a	18. b	19. e	20. b
21. d	22. a	23. d	24. c	25. d	26. c	27. b	28. d	29. b	30. c
31. c	32. d	33. c	34. a	35. c	36. a	37. a	38. c	39. b	40. e
41. b	42. e	43. e	44. a	45. d	46. e	47. d	48. e		