

MERTEN HASSE CALCULUS I EXAM 2017

Name _____

1. Suppose the graph of a function $f(x)$ is given. Which of the following expressions is the graph of $f(x)$ shifted 2 units to the right?

a) $f(x) + 2$

b) $f(x + 2)$

c) $f(x) - 2$

d) none of the previous

2. Classify the function $f(x) = |x|$ as even odd, or neither.

a) Even

b) Odd

c) Neither

d) none of the previous

3. Evaluate the limit if it exists. $\lim_{x \rightarrow -3} \frac{x^2 - 9}{x^2 + 2x - 3}$

a) 0

b) $\frac{3}{2}$

c) DNE

d) none of the previous

4. For $a, b > 0$, evaluate the limit if it exists. $\lim_{t \rightarrow \infty} \frac{at^3 - t + 2}{(bt + 1)(t^2 + t - 1)}$

a) $\frac{a}{b}$

b) $\frac{a}{b^2}$

c) a

d) none of the previous

5. Evaluate the limit if it exists. $\lim_{x \rightarrow 1} \frac{\sin \sqrt{x} - \sin(1)}{x - 1}$.

a) $\cos(1)$

b) $\sin(1)$

c) $\sin(x)$

d) none of the previous

6. Evaluate the limit. $\lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{\pi}{n} \sin\left(\frac{k\pi}{n}\right)$

a) 0

b) 1

c) 2

d) none of the previous

7. Evaluate the limit if it exists. $\lim_{x \rightarrow 0} x^2 \cos\left(\frac{1}{x}\right)$
- a) 0 b) 1
 c) 3 d) none of the previous
8. Evaluate the limit if it exists. $\lim_{x \rightarrow 4^+} \frac{|x - 4|}{x - 4}$
- a) -1 b) 0
 c) 1 d) none of the previous
9. Evaluate the limit if it exists. $\lim_{x \rightarrow \infty} \left(\frac{x^2}{x - 1} - \frac{x^2}{x - 2} \right)$
- a) -2 b) -1
 c) 0 d) none of the previous
10. Evaluate the limit for the function $\lim_{x \rightarrow a} \left(\frac{2f(x)}{h(x) - g(x)} \right)$ given that $\lim_{x \rightarrow a} f(x) = -3$, $\lim_{x \rightarrow a} g(x) = 0$, and $\lim_{x \rightarrow a} h(x) = 8$.
- a) $-\frac{3}{4}$ b) $-\frac{4}{3}$
 c) $\frac{4}{3}$ d) none of the previous
11. If I were to prove that $\lim_{x \rightarrow 3} 5x - 2 = 13$ using an ϵ, δ proof and I were given $\epsilon = .2$, what is the largest value of δ that I could pick?
- a) $\delta = .04$ b) $\delta = .2$
 c) $\delta = 1$ d) none of the previous

12. Calculate the derivative $f'(x)$ of the function given by $f(x) = \int_3^{x^2} \sqrt{2t - 5} dt$.

- a) $f'(x) = \sqrt{2x^2 - 5}$ b) $f'(x) = 2x\sqrt{2x^2 - 5}$
 c) $f'(x) = \sqrt{2x^2 - 5} + C$ d) none of the previous

13. Evaluate $f'(x)$ for the function $f(x) = \frac{\sqrt[3]{x^2}}{\sqrt{x^3}}$.

a) $\frac{5x^{11/6}}{6}$

b) $\frac{-5x^{11/6}}{6}$

c) $\frac{-5}{6x^{11/6}}$

d) none of the previous

14. If $f(x) = \sin x$, calculate $\frac{d^{47}y}{dx^{47}}$.

a) $-\sin(x)$

b) $-\cos(x)$

c) $\cos(x)$

d) none of the previous

15. Evaluate $f'(x)$ for the function $f(x) = x^n \cos(x)$.

a) $f'(x) = x^{n-1}[n \cos(x) - x \sin(x)]$

b) $f'(x) = x^{n-1}[n \cos(x) + x \sin(x)]$

c) $f'(x) = nx^{n-1}[\cos(x) - \sin(x)]$

d) none of the previous

16. Calculate $f''(2)$ for the function $f(t) = \sqrt{4t+1}$.

a) $\frac{-4}{27}$

b) $\frac{2}{3}$

c) 6

d) none of the previous

17. Calculate $f'(x)$ for the function $f(x) = \frac{x^4 - 5x^3 + \sqrt{x}}{x^2}$.

a) $f'(x) = \frac{4x^3 - 15x^2 + x^{1/2}}{2x}$

b) $f'(x) = 2x - 5 - \frac{3}{2x^{5/2}}$

c) $f'(x) = 2x - 5 + \frac{3}{2}x^{5/2}$

d) none of the previous

18. Given the table, evaluate $h'(3)$ for $h(x) = \frac{f(x)}{x + g(x)}$.

x	1	2	3	4	5
$f(x)$	-2	1	3	5	6
$f'(x)$	5	8	6	4	2
$g(x)$	-3	-1	3	8	9
$g'(x)$	0	1	3	2	5

a) $\frac{2}{3}$

b) 1

c) $\frac{4}{3}$

d) none of the previous

19. If $f(x) = 2^\pi$ calculate $f'(x)$.

a) $f'(x) = \pi 2^{(\pi-1)}$

b) $f'(x) = 2^\pi \ln 2$

c) $f'(x) = \pi \ln 2$

d) none of the previous

20. Find the most general form for $f(x)$ if $f'(x) = 2x - 3 \cos(x)$.

a) $f(x) = x^2 - 3 \sin(x) + C$

b) $f(x) = 2 + 3 \cos(x) + C$

c) $f(x) = 2 - 3 \cos(x)$

d) none of the previous

21. Solve for $f(x)$ if $f''(x) = 5x^3 + 6x^2 + 2$, $f'(0) = \frac{-27}{4}$, and $f(0) = 3$.

a) $f(x) = \frac{1}{4}x^5 + \frac{1}{2}x^4 + x^2$

b) $f(x) = \frac{1}{4}x^5 + \frac{1}{2}x^4 + x^2 - \frac{27}{4}x + 3$

c) $f(x) = \frac{1}{4}x^5 + \frac{1}{2}x^4 + x^2 + \frac{27}{4}x + 3$

d) none of the previous

22. Find the domain of the function $f(x) = \sqrt{1-x} \ln(x)$.

a) $(0, 1)$

b) $(0, 1]$

c) $(0, \infty)$

d) none of the previous

23. Find the x value for the inflection point(s) of $f(x) = -2x^3 + 7x^2 - 11x + 2$.

a) $x = 0$ and $x = \frac{7}{3}$

b) $x = 0$ and $x = \frac{-7}{3}$

c) $x = \frac{7}{6}$

d) none of the previous

24. Evaluate the following integral. $\int (10x^2 - 47 + e^{-x}) dx$.

a) $\frac{10}{3}x^3 - 47x - e^{-x} + C$

b) $30x^3 - 47x - e^{-x} + C$

c) $\frac{10}{3}x^3 - 47x + e^{-x} + C$

d) none of the previous

25. Evaluate the integral $\int (1-x)^9 dx$.

a) $-9(1-x)^8 + C$

b) $\frac{-1}{10}(1-x)^{10} + C$

c) $\frac{1}{10}(1-x)^{10} + C$

d) none of the previous

26. Evaluate the integral $\int \sin(x)[\cos(\cos(x))] dx$.

a) $-\sin(\cos(x)) + C$

b) $\sin(\cos(x)) + C$

c) $-\cos(\sin(x)) + C$

d) none of the previous

27. Evaluate the integral $\int_0^1 x\sqrt{1-x} dx$.

a) $\frac{1}{13}$

b) $\frac{1}{12}$

c) $\frac{1}{6}$

d) none of the previous

28. Evaluate the integral $\int_{-4}^4 \frac{\sin(x)}{\sqrt{x^2+1}} dx$.

a) 0

b) 8

c) 4π

d) none of the previous

29. Evaluate the integral $\int_0^1 e^{ax} dx$ for $a > 0$.

a) $ae^a - 1$

b) $\frac{1}{a}e^a - 1$

c) $e^a - 1$

d) none of the previous

30. On what interval(s) is the function $f(x) = 3x^3 - x^4$ increasing?

a) $(-\infty, 0) \cup \left(\frac{9}{4}, \infty\right)$

b) $\left(-\infty, \frac{9}{4}\right)$

c) $\left(\frac{9}{4}, \infty\right)$

d) none of the previous

31. Find the equation of the tangent line to the graph of $f(x) = xe^x$ at $x = 0$.

a) $y = x$

b) $y = x + 1$

c) $y = 2x + 1$

d) none of the previous

32. Find the shortest distance between the line $y = x + b$ for $b \neq -1$, and the point $(1, 0)$.

a) $\frac{1}{2}$

b) $\frac{b^2}{2}$

c) $\frac{(1+b)^2}{2}$

d) none of the previous

33. Find the value of c so that the given function is continuous everywhere.

$$f(x) = \begin{cases} cx + 1 & \text{if } x \leq 3 \\ cx^2 - 1 & \text{if } x > 3 \end{cases}$$

a) $c = \frac{1}{5}$

b) $c = \frac{1}{4}$

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

d) none of the previous

34. Find the absolute minimum of the function $f(x) = \frac{e^x}{x^2}$ on the interval $(0, \infty)$.

a) $\frac{e^2}{4}$

b) $\frac{e^2}{2}$

c) $\frac{e}{4}$

d) none of the previous

35. Let $x(t)$ be the position in feet of an object at time t in seconds as it moves along a number line. If $x(t)$ is given implicitly as $t \ln x = xe^t - 1$, find the velocity at time $t = 0$.

a) -1 ft/sec

b) 0 ft/sec

c) 1 ft/sec

d) none of the previous

36. Find the absolute maximum of the function $f(x) = x^3 + 3x^2 - 9x - 7$ over the interval $[-2, 2]$.

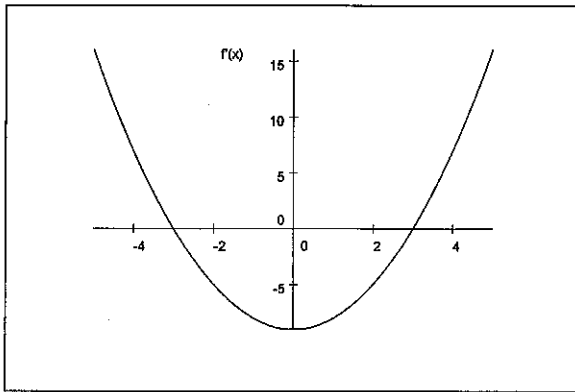
a) 15

b) 20

c) 69

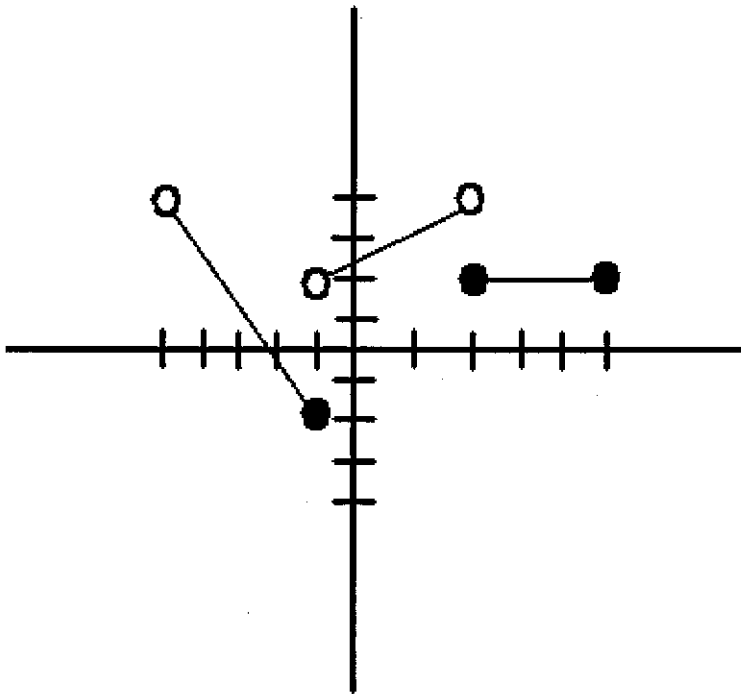
d) none of the previous

37. Given a graph of $f'(x)$ (the derivative of $f(x)$), find the interval where $f''(x) > 0$.



- a) $(-\infty, -3)$ b) $(3, \infty)$
 c) $(0, \infty)$ d) none of the previous

38. Given the graph of $f(x)$ below, where each tick mark represents one unit, evaluate the limit if it exists. $\lim_{x \rightarrow 2^-} f(x)$



- a) 2 b) 4
 c) *DNE* d) none of the previous

39. Given that $f(x)$ is continuous on $[0, 4]$, differentiable on $(0, 4)$, and that $f(0) = f(4)$, what theorem could be used to guarantee that for some $c \in (0, 4)$ we would have $f'(c) = 0$?
- a) The Fundamental Theorem of Calculus b) Rolle's Theorem
 c) The Intermediate Value Theorem d) none of the previous
40. Given that $f(x)$ is continuous on $[2, 5]$, differentiable on $(2, 5)$, $f(2) = 8$ and that $f'(x) \leq 3$ for all $x \in [2, 5]$, what can be said about $f(5)$?
- a) $f(5) \leq 5$ b) $f(5) \leq 11$
 c) $f(5) \leq 17$ d) none of the previous
41. Calculate the area between the two curves $f(x) = \sin(x)$ and $g(x) = \cos(x)$ for $0 \leq x \leq \frac{\pi}{2}$.
- a) 0 b) $\sqrt{2} - 1$
 c) $2\sqrt{2} - 2$ d) none of the previous
42. Find the value of x so that the slope of the tangent line to the graph of the function $f(x) = x + \ln x$ line would be 2.
- a) $x = 1$ b) $x = 2$
 c) $x = e$ d) none of the previous
43. What integral would represent the volume of the region formed by revolving the area bound by $x = 0$, $x = 4$, $y = 0$ and $y = x^2$ about the line $x = 5$ if we were to calculate the volume by the cylindrical shells method?
- a) $\int_0^4 \pi(x^2)^2 dx$ b) $\int_0^4 2\pi(5-x)x^2 dx$
 c) $\int_0^2 2\pi(y)\sqrt{y} dy$ d) none of the previous
44. If an object is dropped from a cliff 48 ft high, with what velocity will it strike the ground? (Note the acceleration due to gravity is 32 ft/sec^2 .)
- a) $\sqrt{3} \text{ ft/sec}$ b) $-32\sqrt{3} \text{ ft/sec}$
 c) $-64\sqrt{3} \text{ ft/sec}$ d) none of the previous

