Calculus 1 Final Exam Review Worksheet

Organic Chemistry Tutor

1. Evaluate the limit shown below:

$$\lim_{X \to 3} \frac{X^2 + 2X - 15}{X^2 - 9}$$

A. 4/3
B. -2
C. 7/5
D. 1
E. -5

2. Evaluate the expression shown below:

$$\frac{d}{dx}\left[X^6 + \frac{3}{X} - \sqrt{X}\right]$$

3. Find the value of c that makes f(x) continuous.

$$f(x) = \begin{cases} 2cx - 6, & x < 3 \\ x^2 + cx, & x \geq 3 \end{cases}$$

A. 1
B. 2
C. 3
D. 4
E. 5

4. Find the derivative of the expression shown below:

$$\frac{d}{dx}\left[e^{4x} \ln(2x + 5)\right]$$

5. Evaluate the following integral:

$$\int \frac{4X^5 + X^4 - 3X^2}{X^2}\, dx$$

6. Find the equation of the tangent line to the curve $x^3 + 4xy^2 + y^3 = 107$ at the point (2, 3) using implicit differentiation.

A. 16x – 25y = 107
B. 16x + 25y = -107
C. 25y – 16x = -107
D. 16x + 25y = 107

7. Which of the following answer choices is equivalent to the expression shown below?

$$\lim_{h \to 0} \frac{sin(x + h) - sin(x)}{h}$$

A. cos (x)
B. ln (x)
C. tan (x)
D. sin (x) – h
E. cos (x + h)

8. Evaluate the integral shown below:

$$\int 2X\sqrt{3X^2 + 5}\, dx$$

9. Water is flowing into a cylinder with a diameter of 6 ft and a height of 10 ft. If the height of the water in the cylinder is increasing at 3 ft/min, at what rate is the volume of the water in the cylinder changing?

10. Identify all intervals where f(x) is increasing given $f(x) = x^3 + 3/2\ x^2 - 36x - 9$.

11. Identify the location and maximum value of the function $f(x) = 16x - x^2 + 5$.

A. (7, 68)
B. (8, 69)
C. (11, 125)
D. (-9, 84)
E. (10, 65)

12. Calculate the average value of the function $f(x) = x^3 + 8x - 4$ over the interval [1, 5].

A. 32
B. 47
C. 59
D. 83
E. 105

13. Evaluate the expression shown below:

$$\frac{d}{dx}\left[\,2X^3 - 7X^2\,\right]^8$$

14. Evaluate the limit expression shown below:

$$\lim_{x \to 4} \frac{\frac{1}{x} - \frac{1}{4}}{x - 4}$$

A. +1/4
B. -2/3
C. -8
D. 12
E. -1/16

15. Identify all intervals where the function $f(x) = x^3 - 6x^2 + 5x + 1$ is concave downward.

16. Perform the operation shown below:

$$\frac{dy}{dx}\left[x^{sinx}\right]$$

17. Calculate the average rate of change of the function $f(x) = x^2 - 5x + 2$ over the interval [1, 5].

A. +1
B. -3
C. +2
D. -5
E. +8

18. Evaluate the limit shown below:

$$\lim_{x \to 9} \frac{x^2 - 81}{\sqrt{x} - 3}$$

A. -18
B. +27
C. -63
D. +81
E. +108

19. Evaluate the expression shown below:

$$\frac{d}{dx} \int_{x^2}^{4} \sqrt{5 + t^4}\, dt$$

20. Find the area of the region bounded by y = x/2 and $y = \sqrt{x}$.

A. 5/6
B. 4
C. 12
D. 4/3
E. 16/3

21. Calculate the value of the solid formed by revolving the region bounded by $y = \sqrt{x}$, $y = 0$, and $x = 3$ about the line $x = 6$.

22. Calculate the volume generated by rotating the region bounded by $y = x^2$, $y = 0$, $x = 1$, and $x = 2$ about the line $x = 4$.

23. Evaluate the limit shown below:

$$\lim_{x \to 0} \frac{\tan(3x)}{5x}$$

24. Perform the indicated operation shown below:

$$\frac{d}{dx}\left[e^{8x} \ln(x) \sin(x)\right]$$

25. Which of the following answer choices is equivalent to the expression shown below?

$$\lim_{x \to 0} [1 - 2x]^{1/x}$$

A. e^{-3}
B. e^{-2}
C. 1/e
D. e
E. e^{2}

26. Perform the indicated operation shown below:

$$\frac{d}{dx}\left(\frac{x^2 + 3}{x^3 - 4}\right)$$

27. Find the value of c guaranteed by Rolle's Theorem in the function $f(x) = x^2 - 8x + 12$ on the interval [2, 6].

A. c = 1
B. c = 2
C. c = 3
D. c = 4
E. c = 5

28. Use linear approximation to estimate $(3.99)^3$.

29. Find the value of c guaranteed by the mean value theorem in the function $f(x) = x^3 - 4x$ on the interval [-2, 4].

A. c = -2
B. c = -1
C. c = 1
D. c = 2
E. c = 3

30. Evaluate the limit shown below:

$$\lim_{x \to 0} \frac{|x|}{x}$$

31. A ball is thrown upward at 96 ft/s from a height of 256 ft. The height of the ball with respect to time is given by the equation $h(t) = -16t^2 + 96t + 256$. (a) How long will it take the ball to hit the ground? (b) What will the velocity of the ball be 4 seconds after it is thrown? (c) Calculate the velocity of the ball just before it hits the ground. (d) Calculate the maximum height of the ball.

32. The acceleration of a particle is given by $a(t) = 2t - 6$. The initial velocity of the particle is 8 ft/s and is located 5 ft east of the origin along the x-axis at t = 1. (a) Write a function for the velocity of the particle v(t). (b) When is the particle moving to the right? (c) What is the position of the particle at t = 5? (d) Calculate the displacement and total distance traveled by the particle in the first 6 seconds.

33. Perform the indicated operation shown below:

$$\int x^2 \, lnx \, dx$$

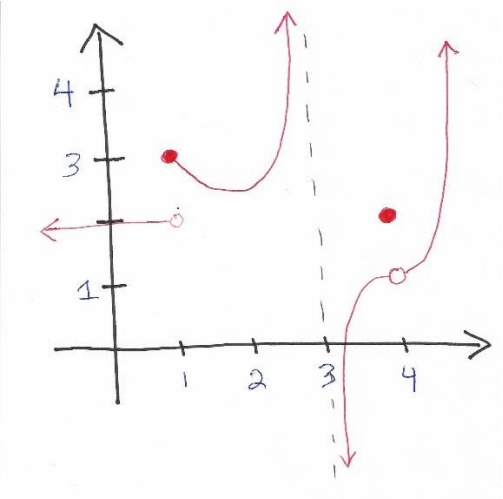
34. Using the table shown below, what is the value of (f o g)'(2)?

x	1	2	3	4
f(x)	1	3	8	-3
g(x)	0	4	5	9
f'(x)	-6	1	-2	7
g'(x)	-4	-5	11	6

35. The rate of water flowing into an empty tank can be modeled by the equation $R(t) = 0.1t^2 + 0.4t + 12$ where R(t) is in gal/min and $t \geq 0$. Calculate the total volume of water accumulated in the tank after 10 minutes.

36. If $\int_1^8 f(x)dx$ = -7, and $\int_1^5 f(x)dx$ = -12, then $\int_8^5 f(x)dx$ = ?

37. Which of the following statements about f(x) is false?



A. The limit as x approaches 4 exists in f(x).
B. f(x) has an infinite discontinuity at x = 3.
C. f(x) has a jump discontinuity at x = 1.
D. f(4) = 2.
E. The limit as x approaches 1 equals 3 in f(x).

38. Evaluate the definite integral shown below:

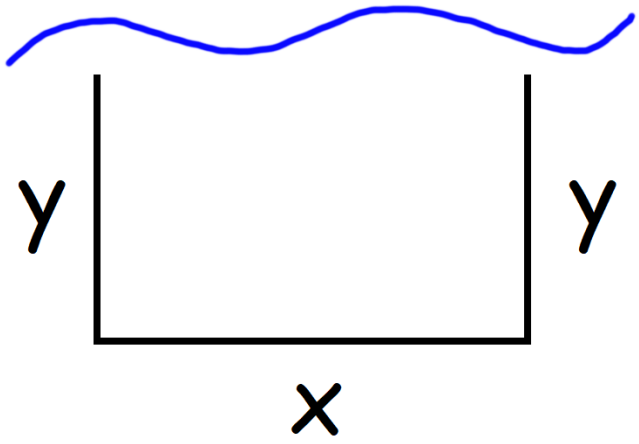
$$\int_0^5 \sqrt{25 - x^2}\, dx$$

A. 25π
B. 5π/2
C. 25π/4
D. 25

39. The table below shows the velocity of an object where v(t) is in m/s and t is in seconds. Use the midpoint rule (n = 5) to estimate the total distance traveled by the object.

t	v(t)
0	12
5	13
10	14
15	13
20	15
25	14
30	16
35	17
40	16
45	18
50	19

40. A farmer wants to set up a rectangular fence adjacent to a river as shown below. The area of the field is 16,200 ft^2. (a) What dimensions will require the least amount of fencing if no fencing is needed along the river?



Answers:

1. A
2. $6X^5 - \frac{3}{X^2} - \frac{1}{2\sqrt{X}}$
3. E
4. $4e^{4x}\ln(2x+5) + \frac{2e^{4x}}{2x+5}$
5. $X^4 + \frac{1}{3}X^3 - 3X + C$
6. D
7. A
8. $\frac{2}{9}\left[\,3X^2 + 5\,\right]^{3/2} + C$
9. $+27\pi\ ft^3 / min$
10. $(-\infty, -4) \cup (3, +\infty)$
11. B
12. C
13. $16X\,(3X-7)\,[2X^3 - 7X^2]^7$
14. E
15. $(-\infty, 2)$
16. $\frac{dy}{dx} = x^{sinx}[cosx\ lnx + \frac{sinx}{x}]$
17. A
18. 108
19. $-2x\sqrt{5+x^8}$
20. D
21. $\frac{84\pi\sqrt{3}}{5}$
22. 67π/6
23. 3/5
24. $e^{8x}[8\ln(x)\sin(x) + \frac{\sin(x)}{x} + \ln(x)\cos(x)]$
25. B
26. $\frac{-x[x^3+9x+8]}{(x^3-4)^2}$
27. D
28. $(3.99)^3 \sim 63.52$, $(3.99)^3 = 63.521199$
29. D
30. The limit does not exist (DNE)
31. (a) t = 8s. (b) -32 ft/s (c) -160 ft/s (d) 400 ft
32. (a) $v(t) = t^2 - 6t + 8$. (b) Right $[0, 2) \cup (4, +\infty)$
    (c) s(t) = +19/3 ft
    (d) displacement = 12 ft, total distance = 44/3ft
33. $\frac{1}{3}x^3\ lnx - \frac{1}{9}\ x^3 + C$
34. -35
35. 520/3 gallons
36. -5
37. E
38. C
39. total distance ~ 750 m
40. x = 180 ft, y = 90 ft