Calculus AB—Exam 1

Section I, Part A

Time: 60 minutes
Number of questions: 30

NO CALCULATOR MAY BE USED IN THIS PART OF THE EXAMINATION.

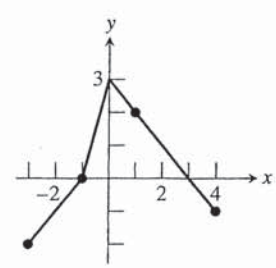
Directions: Solve each of the following problems. After examining the form of the choices, decide which is the best of the choices given.

In this test: Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

1. Let f be the function defined below, where a and b are constants. If f is differentiable at $x = 3$, what is the value of $a - b$?

$$f(x) = \begin{cases} ax - b & \text{for } x < 3 \\ x^2 + bx & \text{for } x \geq 3 \end{cases}$$

(A) 6 (B) 9 (C) 15 (D) 24



2. The graph of a piecewise-linear function f, for $-3 \leq x \leq 4$, is shown above. If $g(x) = \int_{-1}^{x} f(t)\,dt$, which of the following values is the least?

(A) $g(-3)$ (B) $g(0)$ (C) $g(1)$ (D) $g(4)$

3. $\displaystyle\int_2^3 \frac{1}{x^3}\,dx =$

(A) $-\frac{5}{72}$ (B) $-\frac{5}{36}$ (C) $\frac{5}{144}$ (D) $\frac{5}{72}$

4. f is continuous for $a \le x \le b$ but not differentiable for some c such that $a < c < b$. Which of the following could be true?

(A) $x = c$ is a vertical asymptote of the graph of f.

(B) $\lim_{x \to c} f(x) \neq f(c)$

(C) The graph of f has a cusp at $x = c$.

(D) $f(c)$ is undefined.

5. $\int_{\pi/2}^{x} \cos t \, dt =$

(A) $-\sin x$

(B) $-\sin x - 1$

(C) $\sin x - 1$

(D) $1 - \sin x$

6. If $x^3 + 2x^2y - 4y = 7$, then when $x = 1$, $\frac{dy}{dx} =$

(A) -8

(B) $-\frac{9}{2}$

(C) -3

(D) $\frac{7}{2}$

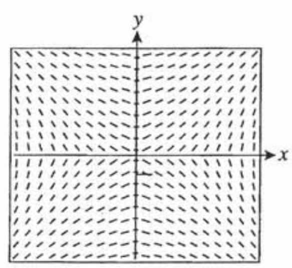
7. $\int_{1}^{e^2} \frac{x^3 + 1}{x} \, dx =$

(A) $\frac{1}{3}e^6 + \frac{5}{3}$

(B) $\frac{1}{3}e^6 - \frac{1}{2e^2} + \frac{1}{6}$

(C) $\frac{1}{3}e^6 - \frac{1}{2e^4} + \frac{1}{6}$

(D) $\frac{1}{3}e^6 + \frac{7}{3}$



8. Shown above is a slope field for which of the following differential equations?

(A) $\frac{dy}{dx} = x - y$

(B) $\frac{dy}{dx} = \frac{x}{y}$

(C) $\frac{dy}{dx} = x + 1$

(D) $\frac{dy}{dx} = xy$

9. $\lim_{x \to \pi/2} \dfrac{1 + \sin 3x}{1 - \cos 4x} =$

(A) $-\dfrac{9}{16}$ (B) $-\dfrac{3}{4}$ (C) 0 (D) $\dfrac{9}{16}$

10. What is the instantaneous rate of change at $x = 3$ of the function f given by $f(x) = \dfrac{x^2 - 2}{x + 1}$?

(A) $-\dfrac{17}{16}$ (B) $-\dfrac{1}{8}$ (C) $\dfrac{13}{16}$ (D) $\dfrac{17}{16}$

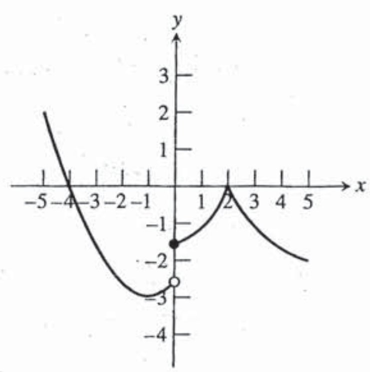
11. If f is a linear function where $0 < a < b$ and m is a nonzero constant, then $\int_b^a f''(x)\,dx =$

(A) 0 (B) $\dfrac{ab}{2}$ (C) $m(a - b)$ (D) $\dfrac{a^2 - b^2}{2}$

12. If $f(x) = \begin{cases} \ln(3x) & \text{for } 0 < x \le 3 \\ x \ln 3 & \text{for } 3 < x \le 4 \end{cases}$, then $\lim_{x \to 3} f(x)$ is

(A) $\ln 9$ (B) $\ln 27$

(C) $3 \ln 3$ (D) nonexistent



13. The graph of the function f shown in the figure has a horizontal tangent at the point $(-1, -3)$ and a cusp at $(2, 0)$. For what values of x, $-5 < x < 5$, is f not differentiable?

(A) 0 only (B) 0 and 2 only

(C) -1 and 0 only (D) -1, 0, and 2

14. A particle moves along the x-axis with velocity given by $v(t) = 3t^2 + 5t - 2$ for $t \geq 0$. If the particle is at position $x = 3$ at time $t = 0$, what is the position of the particle at time $t = 1$?

(A) 1.5 (B) 4.5 (C) 6 (D) 11

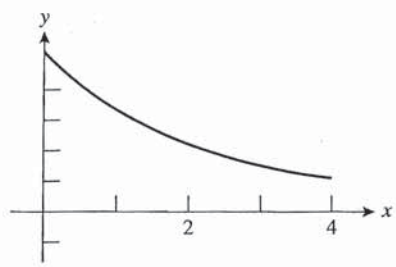
15. If $F(x) = \int_1^{x^2} \sqrt{t^2 + 3}\, dt$, then $F'(2) =$

(A) $\sqrt{7}$ (B) $4\sqrt{7}$ (C) $2\sqrt{19}$ (D) $4\sqrt{19}$

16. If $f(x) = \cos(e^{2x})$, then $f'(x) =$

(A) $-2\sin(e^{2x})$ (B) $-2e^{2x}\sin(e^{2x})$

(C) $2\sin(e^{2x})$ (D) $\sin(e^{2x})$



17. The graph of the function f for $0 \leq x \leq 4$ is shown above. Of the following, which has the greatest value?

(A) Trapezoidal sum approximation of $\int_0^4 f(x)dx$ with 4 subintervals of equal length

(B) Right Riemann sum approximation of $\int_0^4 f(x)dx$ with 4 subintervals of equal length

(C) Left Riemann sum approximation of $\int_0^4 f(x)dx$ with 4 subintervals of equal length

(D) $\int_0^4 f(x)dx$

18. An equation of the line tangent to the graph of $y = 3x - \cos x$ at $x = 0$ is

(A) $y = 2x$ (B) $y = 2x - 1$

(C) $y = 3x + 1$ (D) $y = 3x - 1$

19. If $f''(x) = (x - 1)(x + 2)^3(x - 4)^2$, then the graph of f has inflection points when $x =$

(A) 1 only (B) 1 and 4 only

(C) -2 and 1 only (D) -2, 1, and 4

20. If $\int_2^{-3} f(x)dx = -13$ and $\int_5^{-3} f(x)dx = -10$, what is the value of $\int_2^5 f(x)dx$?

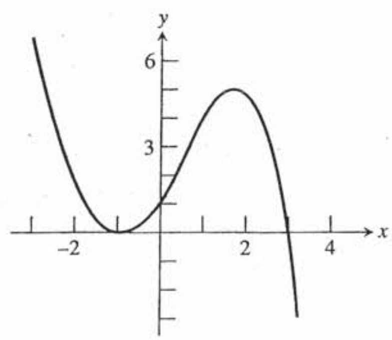
(A) -23 (B) -3

(C) 3 (D) 23

21. If $\dfrac{dy}{dt} = my$ and m is a nonzero constant, then y could be

(A) $4e^{mty}$ (B) $4e^{mt}$

(C) $e^{mt} + 4$ (D) $\dfrac{m}{2}y^2 + 4$



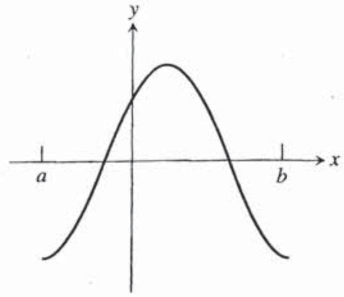
22. The graph of the function f shown above has horizontal tangents at $x = -1$ and $x = \frac{5}{3}$. Let g be the function defined by $g(x) = \int_0^x f(t)dt$. For what values of x does the graph of g have a point of inflection?

(A) 0 only (B) $\dfrac{5}{3}$ only

(C) 3 only (D) -1 and $\dfrac{5}{3}$

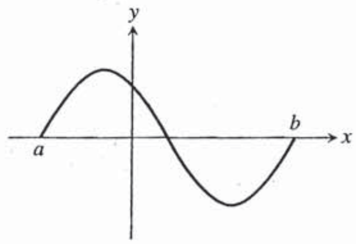
23. The minimum acceleration attained on the interval $0 \le t \le 4$ by the particle whose velocity is given by $v(t) = t^3 - 4t^2 - 3t + 2$ is

(A) -16 (B) -10 (C) $-\dfrac{25}{3}$ (D) -3

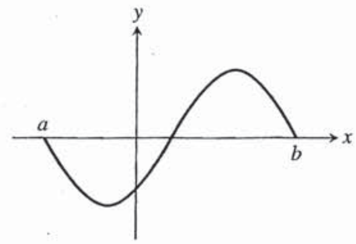


24. The graph of f is shown in the figure above. Which of the following could be the graph of the derivative of f?

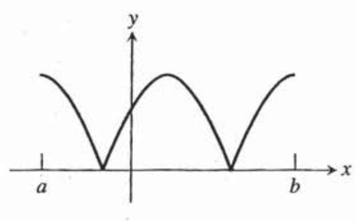
(A)



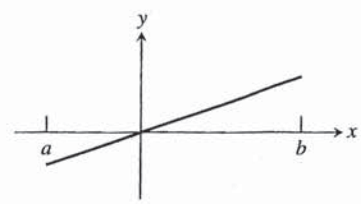
(B)



(C)



(D)



25. What is the area of the region between the graphs of $y = x^3$ and $y = -x - 1$ from $x = 0$ to $x = 2$?

(A) 0 (B) 4 (C) 5 (D) 8

x	-1	0	1	2	3
$f'(x)$	-3	2	0	4	2

26. The polynomial function f has selected values of its first derivative f' given in the table above. Which of the following statements must be true?

(A) f changes concavity at least twice on the interval $(-1, 3)$.

(B) f has a local minimum at $x = 1$.

(C) f is increasing on the interval $(1, 3)$.

(D) f has a local maximum at $x = 2$.

27. What is the average value of $y = x^3\sqrt{x^4 + 9}$ on the interval $[0, 2]$?

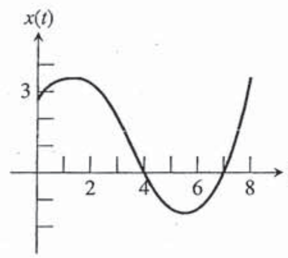
(A) $\frac{98}{3}$ (B) $\frac{49}{3}$ (C) $\frac{125}{12}$ (D) $\frac{49}{6}$

28. If $f(x) = \tan(3x)$, then $f'\left(\frac{\pi}{9}\right) =$

(A) $\frac{4}{3}$ (B) 4 (C) 12 (D) $6\sqrt{3}$

29. The side of a cube is increasing at a constant rate of 0.2 centimeter per second. In terms of the surface area S, what is the rate of change of the volume of the cube, in square centimeters per second?

(A) $0.1S$ (B) $0.2S$ (C) $0.6S$ (D) $0.04S$



30. A particle moves along a straight line. The graph of the particle's position $x(t)$ at time t for $0 < t < 8$ is shown above. The graph has horizontal tangents at $t = 1$ and $t = \frac{17}{3}$ and a point of inflection at $t = \frac{10}{3}$. For what values of t is the velocity of the particle decreasing?

(A) $0 < t < \frac{10}{3}$ (B) $1 < t < \frac{17}{3}$

(C) $4 < t < 7$ (D) $\frac{10}{3} < t < 8$

✧ End of Part A of Section I ✧

Calculus AB—Exam 1
Section I, Part B

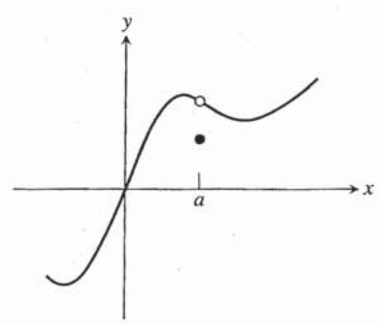
Time: 45 minutes
Number of questions: 15

A GRAPHING CALCULATOR IS REQUIRED FOR SOME QUESTIONS IN THIS PART OF THE EXAMINATION.

Directions: Solve each of the following problems. After examining the form of the choices, decide which is the best of the choices given.

In this test:

1. The exact numerical value of the correct answer does not always appear among the choices given. When this happens, select from among the choices the number that best approximates the exact numerical value.
2. Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.



31. The graph of a function f is shown above. Which of the following statements about f is false?

(A) $\lim_{x \to a} f(x)$ exists.

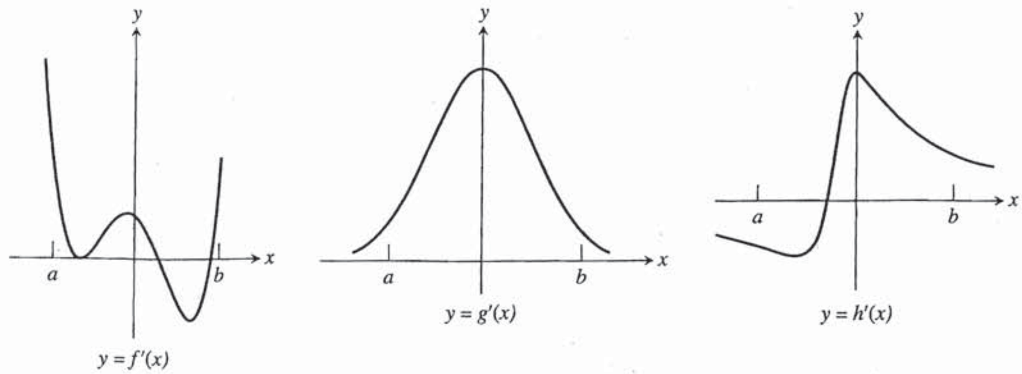
(B) f has a relative minimum at $x = a$.

(C) $f(a)$ exists.

(D) f is continuous at $x = a$.

32. Let $f(x) = 2e^{3x}$ and $g(x) = 5x^3$. At what value of x do the graphs of f and g have parallel tangents?

(A) -0.366 (B) -0.344 (C) -0.251 (D) -0.165



33. The graphs of the derivatives of the functions f, g, and h are shown above. Which of the functions f, g, or h have a relative minimum on the open interval $a < x < b$?

(A) g only (B) h only

(C) f and h only (D) f, g, and h

---

34. The first derivative of the function f is given by $f'(x) = \dfrac{\sin^2 x}{x} - \dfrac{2}{9}$. How many critical values does f have on the open interval $(0, 10)$?

(A) Two (B) Three

(C) Four (D) Six

---

35. Let f be the function given by $f(x) = x^{2/3}$. Which of the following statements about f are true?

I. f is continuous at $x = 0$.

II. f is differentiable at $x = 0$.

III. f has an absolute minimum at $x = 0$.

(A) I only (B) II only

(C) I and II only (D) I and III only

---

36. If f is a continuous function and if $F'(x) = f(x)$ for all real numbers x, then $\int_{-1}^{2} f(3x)dx =$

(A) $3F(2) - 3F(-1)$ (B) $\frac{1}{3}F(2) - \frac{1}{3}F(-1)$

(C) $3F(6) - 3F(-3)$ (D) $\frac{1}{3}F(6) - \frac{1}{3}F(-3)$

37. If $a \neq 0$, then $\lim_{x \to a} \frac{x^3 - a^3}{a^6 - x^6}$ is

(A) nonexistent (B) $-\frac{1}{2a^3}$

(C) 0 (D) $\frac{1}{2a^3}$

38. Population P grows according to the equation $\frac{dP}{dt} = kP$, where k is a constant and t is measured in years. If the population doubles every 12 years, then the value of k is

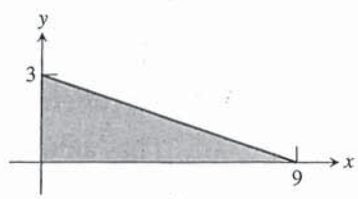
(A) 0.058 (B) 0.279 (C) 0.693 (D) 1.792

x	1	3	6	9
$f(x)$	15	25	40	30

39. The function f is continuous on the closed interval $[1, 9]$ and has values that are given in the table above. Using the subintervals $[1, 3]$, $[3, 6]$, and $[6, 9]$, what is the trapezoidal approximation of $\int_1^9 f(x)dx$?

(A) 110 (B) 175

(C) 242.5 (D) 262.5



40. The base of a solid is a region in the first quadrant bounded by the x-axis, the y-axis, and the line $x + 3y = 9$, as shown in the figure above. If cross sections of the solid perpendicular to the y-axis are isosceles right triangles with the hypotenuses in the xy-plane, what is the volume of the solid?

(A) 6.75 (B) 13.5 (C) 20.25 (D) 40.5

41. Which of the following is an equation of the line tangent to the graph of $f(x) = x^6 - x^4$ at the point where $f'(x) = -1$?

(A) $y = -x - 1.031$ (B) $y = -x - 0.836$

(C) $y = -x + 0.934$ (D) $y = -x + 1.031$

42. Let $G(x)$ be an antiderivative of $f(x)$. If $G(2) = 3$, then $G(8) =$

(A) $f'(8)$ (B) $3 + f'(8)$

(C) $\int_2^8 (3 + f(t))dt$ (D) $3 + \int_2^8 f(t)dt$

43. A particle moves along a straight line with velocity given by $v(t) = 5 + 1.492^{-t^3}$ at time $t \geq 0$. What is the acceleration of the particle at time $t = 2$?

(A) -0.196 (B) 0.7433 (C) 5.041 (D) 11.205

44. Let f be a function that is differentiable on the open interval $(-3, 7)$. If $f(-1) = 4$, $f(2) = -5$, and $f(6) = 8$, which of the following must be true?

I. For some c, $-1 < c < 2$, $f'(c) = -3$.

II. f has a relative minimum at $x = 2$.

III. For some c, $2 < c < 6$, $f(c) = 4$.

(A) I only (B) I and II only

(C) I and III only (D) I, II, and III

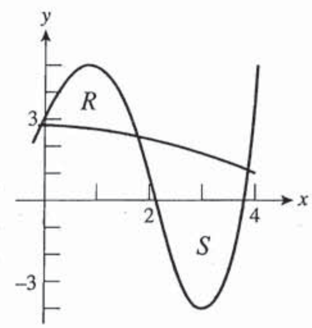
45. If $0 \leq k \leq \frac{\pi}{2}$ and the area under the curve $y = \sin x$ from $x = k$ to $x = \frac{\pi}{2}$ is 0.75, then $k =$

(A) 0.253 (B) 0.723 (C) 0.848 (D) 1.318

Calculus AB—Exam 1
Section II, Part A

Time: 30 minutes
Number of problems: 2

A GRAPHING CALCULATOR IS REQUIRED FOR SOME PROBLEMS IN THIS PART OF THE EXAMINATION.



1. Let f and g be the functions defined by $f(x) = 0.5x^4 - 2.2x^3 + 4x + 2.75$ and $g(x) = 2.75\cos\left(\frac{x}{\pi}\right)$. Let R and S be the two regions enclosed by the graphs of f and g shown in the figure above.

   (a) Find the sum of the areas of the regions R and S.

   (b) Find the volume of the solid generated when R is rotated about the x-axis.

   (c) The region S is the base of a solid whose cross sections perpendicular to the x-axis are squares. Find the volume of the solid.

2. For $0 \leq t \leq 4$, a particle is moving along the x-axis. The velocity of the particle is given by $v(t) = 3\cos(e^{t/2}) + 1.5$. The acceleration of the particle is given by $a(t) = -\frac{3}{2}e^{t/2}\sin(e^{t/2})$ and $x(0) = 2.7$.

(a) Is the speed of the particle increasing or decreasing at time $t = 2.4$? Give a reason for your answer.

(b) Find the average velocity of the particle for the time period $0 \leq t \leq 4$.

(c) Find the total distance traveled by the particle from time $t = 0$ to $t = 4$.

(d) For $0 \leq t \leq 4$, the particle changes direction twice. Find the position of the particle at the time when it changes from moving left to moving right.

✧ **End of Part A of Section II** ✧

Calculus AB—Exam 1
Section II, Part B

Time: 60 minutes
Number of problems: 4

NO CALCULATOR MAY BE USED IN THIS PART OF THE EXAMINATION.

T (days)	0	1	3	4	6
$h(t)$ (cm)	5.1	6.8	11	13.5	20.1

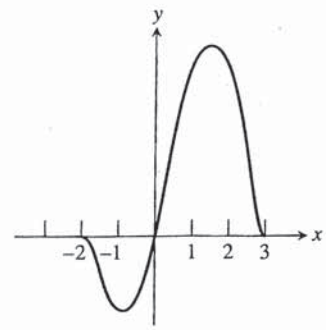
3. Jill bought an amaryllis plant hoping it would soon bloom. She decided to chart its growth before it flowered. The length of a leaf is modeled by a differentiable function h that is increasing and concave up for $0 \leq t \leq 6$. The table above gives selected values of $h(t)$, where t is measured in days and $h(t)$ is measured in centimeters.

(a) Use the data in the table to estimate $h'(3.5)$. Show the computations that lead to your answer.

(b) Using correct units, explain the meaning of $\frac{1}{6}\int_0^6 h(t)dt$ in the context of this problem. Use a right Riemann sum with the four subintervals indicated by the table to estimate $\frac{1}{6}\int_0^6 h(t)dt$.

(c) Is your approximation in part (b) greater than or less than $\frac{1}{6}\int_0^6 h(t)dt$? Give a reason for your answer.

(d) Evaluate $\int_0^6 h'(t)dt$. Explain the meaning of this expression.



4. The figure above shows the graph of f', the derivative of a twice-differentiable function f, on the interval $[-2, 3]$. The graph of f' has horizontal tangents at $x = -2$, $x = -0.8$, $x = 1.4$, and $x = 3$. The areas of the regions bounded by the x-axis and the graph of f' on the intervals $[-2, 0]$ and $[0, 3]$ are 2 and 7 respectively.

   (a) Find all x-coordinates at which f has a relative minimum. Give a reason for your answer.

   (b) On what open intervals contained in $-2 < x < 3$ is the graph of f both concave up and increasing? Give a reason for your answer.

   (c) Find the x-coordinates of all points of inflection for the graph of f. Give a reason for your answer.

   (d) Given that $f(0) = 9$, write an expression for $f(x)$ that involves an integral. Find $f(-2)$ and $f(3)$.

5. Consider the curve given by $x^2 + 3y^2 = 1 + 3xy$. It can be shown that $\dfrac{dy}{dx} = \dfrac{3y - 2x}{6y - 3x}$.

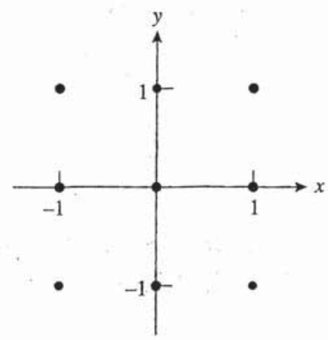
(a) Write an equation for the line tangent to the curve at the point $(1, 1)$.

(b) Find the coordinates of all points on the curve at which the line tangent to the curve at that point is vertical.

(c) Evaluate $\dfrac{d^2y}{dx^2}$ at the point on the curve where $x = 1$ and $y = 1$.

6. Consider the differential equation $\frac{dy}{dx} = x^2(2y + 1)$.

(a) On the axes provided, sketch a slope field for the given differential equation at the nine points indicated.



(b) While the slope field in part (a) is drawn at only nine points, it is defined at every point in the xy-plane. Describe all points in the xy-plane for which the slopes are positive.

(c) Find the particular solution $y = f(x)$ to the given differential equation with the initial condition $f(0) = 5$.

Practice Examinations
Calculus AB—Exam 1

Section I

Part A—No Calculator

Problem	Answer	Key Concept
1.	(A)	Differentiability
2.	(B)	Graph analysis for extrema
3.	(D)	Definite integral
4.	(C)	Continuity/Differentiability
5.	(C)	Definite integral
6.	(B)	Implicit differentiation
7.	(A)	Definite integral
8.	(B)	Slope field
9.	(D)	L'Hospital's Rule
10.	(D)	Instantaneous rate of change
11.	(A)	Relationships of derivatives
12.	(D)	Limit
13.	(B)	Graph analysis for differentiability
14.	(B)	Velocity/Position
15.	(D)	Fundamental Theorem of Calculus
16.	(B)	Derivative with Chain Rule
17.	(C)	Area approximations
18.	(D)	Tangent line
19.	(C)	Points of inflection
20.	(B)	Integration rules
21.	(B)	Exponential growth derivative
22.	(D)	Graph analysis for points of inflection
23.	(C)	Velocity/Acceleration optimization
24.	(A)	Derivative graph
25.	(D)	Area between curves
26.	(A)	Analysis of derivative data
27.	(D)	Average value
28.	(C)	Numerical derivative
29.	(A)	Rate of change
30.	(A)	Graph analysis for Positon/Velocity

Part B—Calculator Allowed

Problem	Answer	Key Concept
31.	(D)	Graph analysis
32.	(A)	Numerical derivative with calculator
33.	(C)	Derivative graph analysis for extrema
34.	(A)	Critical values
35.	(D)	Continuity/Differentiability
36.	(D)	Fundamental Theorem of Calculus
37.	(B)	Limit
38.	(A)	Exponential growth derivative
39.	(C)	Trapezoidal Rule
40.	(C)	Volume by cross section
41.	(A)	Tangent line
42.	(D)	Fundamental Theorem of Calculus
43.	(A)	Velocity/Acceleration
44.	(C)	Mean Value Theorem/Intermediate Value Theorem
45.	(B)	Area under curve

Calculus AB—Exam 1: Section II, Part A

1. $f(x) = g(x)$ at $x = 0, x = 1.8109294$, and $x = 3.7724666$. Let $A = 1.8109294$ and $B = 3.7724666$

   (a) Area $= \int_0^A [f(x) - g(x)]dx + \int_A^B [g(x) - f(x)]dx = 9.931$

   (b) Volume $= \pi \int_0^A [(f(x))^2 - (g(x))^2]dx = 64.325$

   (c) Volume $= \int_A^B (g(x) - f(x))^2 dx = 31.790$

2. (a) $v(2.4) \approx -1.452 < 0$ and $a(2.4) \approx 0.884 > 0$. Since the velocity and acceleration have opposite signs, the speed is decreasing at $t = 2.4$.

   (b) Average velocity $= \frac{1}{4} \int_0^4 v(t)dt = 1.158$

   (c) Total Distance $= \int_0^4 |v(t)| dt = 7.309$

   (d) The particle changes from moving left to moving right when the velocity changes from negative to positive.

   $x(2.865) = 2.7 + \int_0^{2.865} v(t)dt = 3.967$

3. (a) $h'(3.5) \approx \dfrac{h(4) - h(3)}{4 - 3} = \dfrac{13.5 - 11}{1} = 2.5$ cm/day

   (b) $\frac{1}{6} \int_0^6 h(t)dt$ is the average length of a leaf in centimeters during the first six days of the data collection.

   $\frac{1}{6} \int_0^6 h(t)dt \approx \frac{1}{6} [1(6.8) + 2(11) + 1(13.5) + 2(20.1)] = \dfrac{82.5}{6} = 13.75$ cm

   (c) Since the graph of $h(t)$ is strictly increasing on $[0, 6]$, the right Riemann sum is an over-estimate, and therefore greater than the true area.

   (d) $\int_0^6 h'(t)dt = h(6) - h(0) = 20.1 - 5.1 = 15$. The leaf grew a total of 15 cm in the first six days.

Calculus AB—Exam 1: Section II, Part B

4. (a) $f'(x) = 0$ at $x = -2, x = 0$, and $x = 3$. $x = 0$ is the only critical point where f' changes from negative to positive. Therefore, f has a relative minimum at $x = 0$.

   (b) f is concave up when f'' is positive, which is where f' is increasing. f is increasing where f' is positive. Therefore, f is both concave up and increasing on $0 < x < 1.4$ because f' is both increasing and positive on this interval.

   (c) The graph of f has inflection points at $x = -0.8$, where f' changes from decreasing to increasing and at $x = 1.4$, where f' changes from increasing to decreasing.

   (d) $f(x) = 9 + \int_0^x f'(t)dt$

   $f(-2) = 9 + \int_0^{-2} f'(t)dt = 9 + 2 = 11$

   $f(3) = 9 + \int_0^3 f'(t)dt = 9 + 7 = 16$

5. (a) $\left.\dfrac{dy}{dx}\right|_{(1,1)} = \dfrac{3-2}{6-3} = \dfrac{1}{3} \Rightarrow y - 1 = \dfrac{1}{3}(x-1)$

   (b) $6y - 3x = 0 \Rightarrow 2y = x$

   $(2y)^2 + 3y^2 = 1 + 3(2y)y$

   $4y^2 + 3y^2 = 1 + 6y^2$

   $y^2 = 1$

   $y = \pm 1 \Rightarrow x = \pm 2$

   $(-2, -1)$ and $(2, 1)$

   (c) $$\frac{d^2y}{dx^2} = \frac{dy}{dx}\left(\frac{3y-2x}{6y-3x}\right) = \frac{(6y-3x)\left(3\dfrac{dy}{dx} - 2\right) - (3y-2x)\left(6\dfrac{dy}{dx} - 3\right)}{(6y-3x)^2}$$

   $$\left.\frac{d^2y}{dx^2}\right|_{(1,1)} = \frac{(6-3)\left(3\cdot\frac{1}{3} - 2\right) - (3-2)\left(6\cdot\frac{1}{3} - 3\right)}{(6-3)^2} = \frac{3(-1) - 1(-1)}{9} = -\frac{2}{9}$$

6. (a)

(b) Slopes are positive for points where $x \neq 0$ and $y > -\frac{1}{2}$.

(c) $\displaystyle\int \frac{dy}{2y+1} = \int x^2 dx$

$\displaystyle\frac{1}{2}\int \frac{2dy}{2y+1} = \int x^2 dx$

$\frac{1}{2}\ln|2y+1| = \frac{1}{3}x^3 + C$

$\ln|2y+1| = \frac{2}{3}x^3 + C$

$|2y + 1| = e^{\frac{2}{3}x^3 + C}$

$|2y + 1| = Ce^{\frac{2}{3}x^3}$

$|2(5) + 1| = Ce^0$

$11 = C$

$2y + 1 = 11e^{\frac{2}{3}x^3}$

$2y = 11e^{\frac{2}{3}x^3} - 1$

$y = \frac{1}{2}\left(11e^{\frac{2}{3}x^3} - 1\right)$