

AOS Senior AP Calculus BC, Spring 2024

AP Test Review, Exam 1

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ACADEMIES OF LOUDOUN

HONOR CODE



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Student Signature

Class

Date

Print Name:

1. Evaluate

$$\lim_{h \rightarrow 0} \frac{\sec(3(x+h)) - \sec(3x)}{h}$$

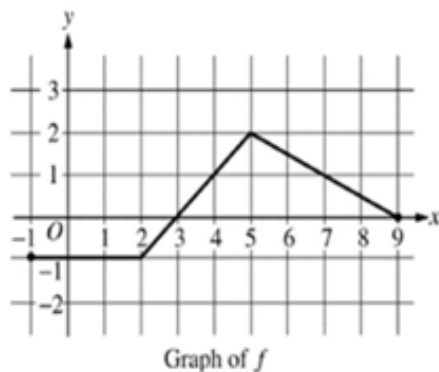
- (a) $3 \sec^2(3x)$
- (b) $3 \tan^2(3x)$
- (c) $3 \sec(x) \tan(x)$
- (d) $9 \tan^2(3x)$
- (e) $3 \sec(3x) \tan(3x)$

2. Evaluate

$$\int_0^3 \frac{x^2 + 5x + 6}{x + 2} dx =$$

- (a) $\frac{17}{2} - 2 \ln 2$
- (b) $\frac{15}{2}$
- (c) $\frac{27}{2}$
- (d) $\frac{15}{2} + 2 \ln 2$
- (e) $4 + 2 \ln 2$

3. The graph of a piecewise linear function f is given.



What is the value of $\int_1^7 (4f(x) - 1) dx$?

- (a) 9
- (b) 8
- (c) 9.5
- (d) 7.5
- (e) 10

4. Evaluate

$$\int_1^{\infty} x e^{-(x^2-1)} dx$$

(a) divergent

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

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

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

(e) 2

5. Let f be the function given by

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

What are all values of a and b for which f is differentiable at $x = 2$?

(a) $a = \frac{1}{6}$ $b = \frac{-1}{3}$

(b) $a = \frac{-1}{6}$ $b = \frac{1}{3}$

(c) $a = \frac{1}{6}$ $b = \frac{-2}{3}$

(d) $a = \frac{-1}{6}$ $b = \frac{-2}{3}$

(e) $a = \frac{1}{3}$ $b = \frac{-2}{3}$

6. If the function f is continuous for all real numbers and if $f(x) = \frac{x^2 - 25}{x - 5}$ when $x \neq 5$, then $f(5) =$

(a) 10

(b) 5

(c) 25

(d) -5

(e) -10

7. Evaluate

$$\lim_{x \rightarrow e} \frac{\ln x - 1}{x - e}$$

(a) $2e$

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

(c) e

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

(e) 1

8. Integrate

$$\int x^3 e^{2x} dx$$

(a) $\frac{1}{8} e^{2x} (2x^3 - 3x^2 + 6x - 3) + C$

(b) $\frac{1}{8} e^{2x} (4x^3 + 6x^2 - x + 3) + C$

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

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

(e) $\frac{1}{8} e^{2x} (4x^3 - 6x^2 + 6x - 3) + C$

9. Evaluate

$$\int \frac{\cos(\sqrt{x} + 1)}{\sqrt{x}} dx =$$

(a) $\frac{1}{2} \sin(\sqrt{x} + 1) + C$

(b) $2 \sin(\sqrt{x} + 1) + C$

(c) $\ln |\cos(\sqrt{x} + 1)| + C$

(d) $\ln |\sin(\sqrt{x} + 1)| + C$

(e) $\cos(\sqrt{x} + 1) + C$

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10. The function g is continuous on the closed interval $[2, 10]$. If $\int_9^1 g(x) dx = 25$ and $\int_1^5 \frac{g(x)}{2} dx = -12$, then

$$\int_5^9 g(x) dx =$$

- (a) 13
- (b) -1
- (c) -13
- (d) 1
- (e) 49

11. Evaluate

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2 + \sin(4x)} =$$

- (a) 1
- (b) 0
- (c) -1
- (d) $\frac{\pi}{2}$
- (e) π

12. Evaluate

$$\int \frac{9x + 1}{(2x + 1)(x - 3)} dx$$

- (a) $\ln |2x + 1| + \ln |x - 3| + C$
- (b) $\frac{1}{2} \ln |2x + 1| - 2 \ln |x - 3| + C$
- (c) $\frac{1}{2} \ln |2x + 1| + 4 \ln |x - 3| + C$
- (d) $4 \ln |2x + 1| - 2 \ln |x - 3| + C$
- (e) $2 \ln |2x + 1| - 4 \ln |x - 3| + C$

13. Evaluate

$$\int \frac{1}{x^2 - 16x + 80} dx =$$

- (a) $\frac{1}{4} \arctan \left(\frac{x - 8}{4} \right) + C$
- (b) $\frac{1}{6} \arctan \left(\frac{x - 8}{6} \right) + C$
- (c) $\frac{1}{\ln |x^2 - 16x + 80|} + c$
- (d) $2 \ln |x - 20| - 4 \ln |x + 4| + C$
- (e) $\frac{x}{6} \arctan \left| \frac{x - 8}{6} \right| + C$

14. If f is the function defined

$$f(x) = \begin{cases} x^2 & \text{for } x < 3 \\ \frac{1}{3} & \text{for } x \geq 3 \end{cases}$$

then $\int_{-2}^4 f(x)dx$ is

(a) 12

(b) $\frac{28}{3}$

(c) 13

(d) $\frac{20}{3}$

(e) $\frac{-28}{3}$

15. Using the substitution $u = 2x^2 + 1$, the integral $\int_2^4 2x(2x^2 + 1)^3 dx$ is equal to which of the following?

(a) $\frac{1}{4} \int_9^{33} u^3 du$

(b) $2 \int_9^{33} u^3 du$

(c) $\frac{1}{2} \int_9^{33} u^3 du$

(d) $2 \int_9^{33} u^3 du$

(e) $\frac{1}{2} \int_9^{33} u^3 du$

16. Evaluate

$$\int \frac{2x}{x^2 + 9} dx =$$

(a) $\frac{x}{3} \arctan\left(\frac{x}{3}\right) + C$

(b) $\frac{1}{2} \ln(x^2 + 9) + C$

(c) $\frac{1}{x^2 + 9} + C$

(d) $\frac{2}{(x^2 + 9)} + C$

(e) $\ln(x^2 + 9) + C$

KEY

1. E
2. C
3. B
4. B
5. C
6. A
7. D
8. E
9. B
10. B
11. B
12. C
13. A
14. A
15. C
16. E