AOS Senior AP Calculus BC, Spring 2024
AP Test Review, Exam 1

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Student Signature **Class** **Date**

Print Name:

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

   (a) 5

   (b) -10

   (c) 10

   (d) 25

   (e) -5

2. Integrate

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

   (a) $\dfrac{1}{4}e^{2x}\left(4x^3 - 6x^2 + 6x - 3\right) + C$

   (b) $\dfrac{1}{8}e^{2x}\left(2x^3 - 3x^2 + 6x - 3\right) + C$

   (c) $\dfrac{1}{8}e^{2x}\left(4x^3 - 6x^2 + 6x - 3\right) + C$

   (d) $\dfrac{1}{8}e^{2x}\left(4x^3 + 6x^2 - x + 3\right) + C$

   (e) $\dfrac{1}{4}e^{2x}\left(4x^3 + 6x^2 + 6x + 3\right) + C$

3. The function g is continuous on the closed interval $[2, 10]$. If $\displaystyle\int_9^1 g(x)dx = 25$ and $\displaystyle\int_1^5 \frac{g(x)}{2}\, dx = -12$, then $\displaystyle\int_5^9 g(x)\, dx =$

   (a) 13

   (b) 49

   (c) 1

   (d) -13

   (e) -1

4. Evaluate

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

   (a) 1

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

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

   (d) e

   (e) $2e$

5. 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) $\frac{28}{3}$

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

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

(d) 13

(e) 12

6. Evaluate

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

(a) $\frac{15}{2} + 2\ln 2$

(b) $\frac{17}{2} - 2\ln 2$

(c) $4 + 2\ln 2$

(d) $\frac{15}{2}$

(e) $\frac{27}{2}$

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

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

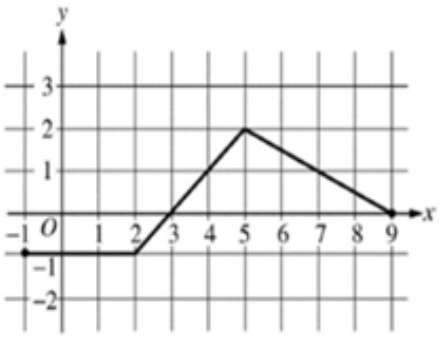
(b) $\frac{1}{2}\int_9^{33} u^3 \, du$

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

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

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

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



Graph of f

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

(a) 7.5

(b) 9

(c) 9.5

(d) 8

(e) 10

9. Evaluate

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

(a) $\dfrac{1}{x^2+9} + C$

(b) $\dfrac{x}{3} \arctan\left(\dfrac{x}{3}\right) + C$

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

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

(e) $\dfrac{1}{2} \ln(x^2+9) + C$

10. Evaluate

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

(a) $\frac{1}{2} \ln|2x+1| - 2\ln|x-3| + C$

(b) $\ln|2x+1| + \ln|x-3| + C$

(c) $4\ln|2x+1| - 2\ln|x-3| + C$

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

(e) $2\ln|2x+1| - 4\ln|x-3| + C$

11. 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) $a = \dfrac{-1}{6} \quad b = \dfrac{1}{3}$

(b) $a = \dfrac{-1}{6} \quad b = \dfrac{-2}{3}$

(c) $a = \dfrac{1}{3} \quad b = \dfrac{-2}{3}$

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

(e) $a = \dfrac{1}{6} \quad b = \dfrac{-1}{3}$

12. Evaluate

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

(a) 2

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

(c) divergent

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

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

13. Evaluate

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

(a) $2\ln|x - 20| - 4\ln|\,| + 4| + C$

(b) $\dfrac{x}{6}\arctan\left|\dfrac{x-8}{6}\right| + C$

(c) $\dfrac{1}{\ln|x^2 - 16x + 80|} + c$

(d) $\dfrac{1}{6}\arctan\left(\dfrac{x-8}{6}\right) + C$

(e) $\dfrac{1}{4}\arctan\left(\dfrac{x-8}{4}\right) + C$

14. Evaluate

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

(a) $\ln\left|\sin\left(\sqrt{x}+1\right)\right|+C$

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

(c) $\frac{1}{2}\sin\left(\sqrt{x}+1\right)+C$

(d) $\ln\left|\cos\left(\sqrt{x}+1\right)\right|+C$

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

15. Evaluate

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

(a) $3\sec(3x)\tan(3x)$

(b) $3\sec(x)\tan(x)$

(c) $3\tan^2(3x)$

(d) $9\tan^2(3x)$

(e) $3\sec^2(3x)$

16. Evaluate

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

(a) π

(b) 0

(c) $\frac{\pi}{2}$

(d) 1

(e) -1

KEY

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