

Name _____

AP Calculus (Chapter 4 Test Review)

1. Evaluate the integral: $\int (3x^3 - 2x^2 + 5) dx$.

[A] $\frac{3}{4}x^4 - \frac{2}{3}x^3 + C$

[B] $9x^2 - 4x + C$

[C] $\frac{3}{4}x^4 - \frac{2}{3}x^3 + 5x + C$

[D] $9x^4 - 8x^3 + 60x + C$

[E] None of these

2. Evaluate the integral: $\int (ax + b) dx$.

[A] $\frac{a}{2}x^2 + bx + C$

[B] $\frac{ab}{2}x^2 + C$

[C] $\frac{a}{2}x^2 + bx$

[D] $a + C$

[E] None of these

3. Evaluate the integral: $\int \frac{x^3 + x}{x} dx$.

[A] $\frac{2x^3 + x - 1}{x^2}$

[B] $x^3 + 3x + C$

[C] $2x + C$

[D] $\frac{x^3}{3} + x + C$

[E] None of these

4. Evaluate the integral: $\int \frac{3 + 4x^{3/2}}{\sqrt{x}} dx$.

[A] $6\sqrt{x} + 2x^2 + C$

[B] $\frac{3}{2}\sqrt{x} + 2x^2 + C$

[C] $-\frac{3}{2}x^{-3/2} + 4 + C$

[D] $\frac{3}{2}x^{-3/2} + 2x^2 + C$

[E] None of these

5. Use $a(t) = -32 \text{ ft/s}^2$ as the acceleration due to gravity. A ball is thrown vertically upward from the ground with an initial velocity of 96 feet per second. How high will the ball go?

[A] 144 feet

[B] 24 feet

[C] 64 feet

[D] 32 feet

[E] None of these

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6. An object has a constant acceleration of 72 feet per second squared, an initial velocity of 17 feet per second, and an initial position of 10 feet. Find the position function describing the motion of this object.
- [A] $s = 72t^2 + 10$ [B] $s = 36t^2 + 27$ [C] $s = 36t^2 + 17t + 10$
[D] $s = 72t^2 + 17t + 10$ [E] None of these
7. The rate of growth of a particular population is given by $\frac{dP}{dt} = 50t^2 - 100t^{3/2}$, where P is the population size and t is the time in years. The initial population is 25,000. Find the population function. Then use a graphing utility to graph the function, and then use the graph to estimate how many years it will take for the population to reach 50,000.
- [A] 15.7 [B] 38.4 [C] 2 [D] 14.5 [E] None of these
8. Identify the sum that does not equal the others.
- [A] $\sum_{k=1}^6 (3k - 2)$ [B] $\sum_{n=0}^5 (3n + 1)$ [C] $\sum_{j=3}^8 (3j - 8)$
[D] $\sum_{i=1}^6 (i + 2)$ [E] None of these
9. Let $s(n) = \sum_{i=1}^n \left(1 + \frac{i}{n}\right)^2 \left(\frac{1}{n}\right)$. Find the limit of $s(n)$ as $n \rightarrow \infty$.
- [A] $\frac{17}{24}$ [B] $\frac{10}{3}$ [C] $\frac{7}{3}$ [D] $\frac{5}{3}$ [E] None of these
10. Find the limit of $s(n)$ as $n \rightarrow \infty$. $s(n) = \sum_{i=1}^n \frac{8i - n}{n^2}$
- [A] 8 [B] 9 [C] 4 [D] 5 [E] None of these
11. Use the properties of sigma notation and the summation formulas to evaluate the given sum:
- $\sum_{i=1}^{10} (i^2 + 3i - 2)$.
- [A] 128 [B] 530 [C] 915 [D] 126 [E] None of these

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12. Use the Fundamental Theorem of Calculus to evaluate $\int_{-2}^1 (1-2x) dx$.
[A] 2 [B] -2 [C] 6 [D] -6 [E] None of these
13. Find the average value of $f(x) = 2x^2 + 3$ on the interval $[0, 2]$.
[A] $\frac{22}{3}$ [B] 4 [C] 27 [D] $\frac{17}{3}$ [E] None of these
14. Evaluate the integral: $\int x^2(x^3 + 5)^6 dx$.
[A] $\frac{1}{21}(x^3 + 5)^7 + C$ [B] $\frac{x^3(x^3 + 5)^7}{27} + C$ [C] $\frac{1}{7}(x^3 + 5)^7 + C$
[D] $\frac{x^3}{3}\left(\frac{x^4}{4} + 5x\right)^6 + C$ [E] None of these
15. Use the general power rule to evaluate the integral: $\int x\sqrt{8-4x^2} dx$.
[A] $\frac{2}{3}(8-4x^2)^{3/2} + C$ [B] $-\frac{1}{3}(8-4x^2)^{3/2} + C$ [C] $-\frac{1}{8}(8-4x^2)^{3/2} + C$
[D] $-\frac{1}{12}(8-4x^2)^{3/2} + C$ [E] None of these
16. Use the general power rule to evaluate the integral: $\int x\sqrt{4-9x^2} dx$.
[A] $\frac{2}{3}(4-9x^2)^{3/2} + C$ [B] $-\frac{4}{27}(4-9x^2)^{3/2} + C$ [C] $-\frac{1}{27}(4-9x^2)^{3/2} + C$
[D] $-\frac{1}{18}(4-9x^2)^{3/2} + C$ [E] None of these

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17. Evaluate the integral: $\int \frac{1}{\sqrt{2x+1}} dx$.

[A] $\sqrt{2x+1} + C$

[B] $\frac{1}{2}\sqrt{2x+1} + C$

[C] $\frac{1}{\sqrt{x^2+x}} + C$

[D] $\sqrt{x^2+x} + C$

[E] None of these

18. Evaluate the integral: $\int \cos 3x dx$:

[A] $-\sin \frac{3}{2}x^2 + C$

[B] $-\sin 3x + C$

[C] $\frac{1}{3} \sin 3x + C$

[D] $\sin 3x + C$

[E] None of these

19. Evaluate the integral: $\int x\sqrt{1-x} dx$.

[A] $-\frac{x^2}{3}(1-x)^{3/2} + C$

[B] $\frac{2-3x}{2\sqrt{1-x}} + C$

[C] $\frac{x^2}{3}(1-x)^{3/2} + C$

[D] $-\frac{2}{15}(2+3x)(1-x)^{3/2} + C$

[E] None of these

20. Evaluate the integral: $\int \frac{5x}{\sqrt{x+2}} dx$.

[A] $5(x-4 \ln \sqrt{x+2}) + C$

[B] $\frac{10}{3}\sqrt{x+2}(x-4) + C$

[C] $\frac{5}{2}(x-4 \ln \sqrt{x+2}) + C$

[D] $\frac{2}{3}\sqrt{x+2}(x-4) + C$

[E] None of these

21. Use the Trapezoidal Rule, with $n = 4$, to approximate $\int_2^3 \frac{1}{(x-1)^2} dx$.

[A] 0.5090

[B] 2.5000

[C] 1.7396

[D] 0.5004

[E] None of these

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22. Differentiate: $y = \frac{3x}{x^2 + 1}$.

- [A] $\frac{3}{1+x^2}$ [B] $\frac{3}{2x}$ [C] $\frac{3x^2 - 3}{(1+x^2)^3}$ [D] $\frac{3(1-x^2)}{(1+x^2)^2}$ [E] None of these

23. Find $f'(x)$: $f(x) = 3x^4 - 6x^3 + 3x - 2$.

- [A] $3x^4 - 6x^3 + 3x$ [B] $12x^3 - 18x^2 + 3$ [C] $3x^3 - 6x^2 + 3$
[D] $12x^3 - 18x^2 + 3x - 2$ [E] None of these

24. Find $f'(x)$: $f(x) = \frac{x^2 - 3x}{x^2}$.

- [A] $1 - \frac{3}{x}$ [B] $\frac{2x - 3}{x^2}$ [C] $\frac{2x - 3}{2x}$ [D] $\frac{3}{x^2}$ [E] None of these

25. Find all critical numbers for the function: $f(x) = (9 - x^2)^{3/5}$.

- [A] $-3, 3$ [B] $-3, 0, 3$ [C] 0 [D] 3 [E] None of these

26. Find the domain of $f(x) = \frac{1}{\sqrt{3-2x}}$.

- [A] $\left(\frac{3}{2}, \infty\right)$ [B] $\left(-\infty, \frac{3}{2}\right), \left(\frac{3}{2}, \infty\right)$ [C] $\left(-\infty, \frac{3}{2}\right)$
[D] $\left[\frac{3}{2}, \infty\right)$ [E] None of these

27. Find all points of intersection of the graphs of $x^2 + 3x - y = 3$ and $x + y = 2$.

- [A] $(-5, -3), (1, 1)$ [B] $(-5, 7), (1, 1)$ [C] $(0, -3), (0, 2)$
[D] $(5, -3), (1, 1)$ [E] None of these

28. Find $f'(x)$ for $f(x) = (2x^2 + 5)^7$.

- [A] $(4x)^7$ [B] $7(4x)^6$ [C] $28x(2x^2 + 5)^6$ [D] $7(2x^2 + 5)^6$ [E] None of these