AP Calculus Definite Integral Review (Ch 4)

Name: _____ **Date:** _____

1. Consider the integral $\int \frac{1}{x}\,dx$ from $x = 2$ to $x = 5$. Using a Riemann sum with 6 sub-intervals calculate the area under the curve, and above the x-axis, using left endpoints. Answer to 3 decimal places.

   A. 0.846 B. 0.996 C. 1.821 D. 2.309

2. Consider the integral $\int \times^2\,dx$ from $x = 2$ to $x = 6$. Using a Riemann sum with 4 sub-intervals calculate the area under the curve, and above the x-axis, using *midpoints*.

   A. 72 B. 66 C. 69 D. 58

3. Use a Trapezoidal approximation for $\int_1^3 x^3\,dx$ with $n = 4$.

   A. 19.75 B. 21.5 C. 19.5 D. 20.5

4. The following table shows selected coordinates for $y = f(x)$:

x	1	2	3	4
y	2.6	3.4	5.8	10.2

   Given that f is continuous on $[1, 4]$, find a trapezoidal approximation, with $n = 3$, for the area under the curve from $x = 1$ to $x = 4$.

5. Evaluate: $\int \frac{2x^2 + 3x^{1/2} + 4}{x^{1/2}}\,dx$

   A. $\frac{4}{5}x\sqrt{x} + 2\sqrt{x} + C$ B. $3x + \frac{4}{5}x^2\sqrt{x} + 4 + C$ C. $3x + \frac{5}{4}x^2\sqrt{x} + 2 + C$ D. $3x + \frac{4}{5}x^2\sqrt{2x} + 4 + C$

6. Use the Fundamental Theorem of Calculus to evaluate $\int_2^4 x^2\,dx$.

   A. -12 B. 3 C. 12 D. $\frac{56}{3}$

7. Use the Fundamental Theorem of Calculus to evaluate $\int_{-1}^1 (\sqrt[3]{t} - 2)\,dt$.

   A. -4 B. $-\frac{5}{2}$ C. $-\frac{2}{3}$ D. $\frac{3}{2}$

8. Find the definite integral $\int_0^3 2x(x^3 - 2x^2 + 5)\,dx$.

A. $\frac{306}{5}$ B. $\frac{207}{4}$ C. $\frac{4}{207}$ D. 61

9. Evaluate: $\int_3^5 |x - 2|\,dx$

A. 0 B. 4 C. 5 D. 6

10. Choose the correct statement given that $\int_0^5 f(x)\,dx = 7$ and $\int_2^5 f(x)\,dx = -1$.

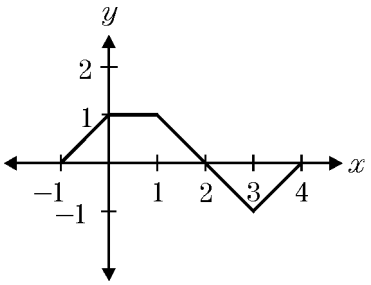
A. $\int_0^2 f(x)\,dx = 6$ B. $\int_5^2 f(x)\,dx = -1$ C. $\int_0^2 f(x)\,dx = 8$ D. $\int_2^0 f(x)\,dx = -6$

11. Which of the following is a correct statement if $\int_0^9 f(x)\,dx = 5$ and $\int_3^9 f(x)\,dx = -1$?

A. $\int_3^0 f(x)\,dx = 6$ B. $\int_9^3 f(x)\,dx = -1$ C. $\int_0^3 f(x)\,dx = 4$ D. $\int_0^3 f(x)\,dx = 6$

12. The graph of f is shown for $-1 \le x \le 4$. What is the value of $\int_{-1}^4 f(x)\,dx$?

A. 1 B. 3 C. 4 D. 0



13. If $\int_1^5 f(x)\,dx = 3$ and $\int_1^5 g(x)\,dx = -9$, then what is the value of $\int_1^5 (2f + 3g)(x)\,dx$?

A. 21 B. −21 C. −9 D. 5

14. If $\int_0^a x^3\,dx = k$ for $a > 0$ then, in terms of k, $\int_2^{a+2} (x - 2)^3\,dx =$ _____

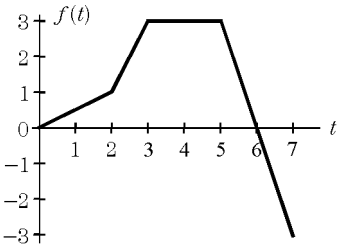
A. $k - 2$ B. $k + 2$ C. k D. $8k$

15. $\int_0^x \cos t\,dt =$

A. $\sin x - 1$ B. $\sin x + 1$ C. $\sin x$ D. $-\sin x - 1$

16. For what value(s) of k does $\int_4^k x\,dx = 10$?

A. 6 only B. ± 6 C. $2\sqrt{5}$ D. $\pm 2\sqrt{5}$

17. 

The graph of $f(t)$ is shown. Fill in the table for $F(x) = \int_0^x f(t)\,dt$.

x	0	2	3	5	6	7
$F(x)$						

18. Evaluate $\frac{d}{dx}\int_0^x (t^3 - 4t + 3)\,dt$ for $x \geq 0$.

A. $x^3 - 4$ B. $t^3 + 4t$ C. $3t^2 - 4$ D. $x^3 - 4x + 3$

19. $\frac{d}{dx}\int_1^x \sqrt{3\cos^2 t + 4}\,dt =$

A. $-6\cos t \sin t$ B. $\sqrt{3\cos^2 x + 4}$ C. $6\cos t \sin t$ D. 0

20. $\frac{d}{dx}\int_x^2 \frac{5t}{2t^3 - 3}\,dt =$

A. $\frac{5t}{2t^3 - 3}$ B. $-\frac{5t}{2t^3 - 3}$ C. $-\frac{5x}{2x^3 - 3}$ D. $\frac{10}{13}$

21. $\frac{d}{dx}\int_5^{x^3} \frac{dt}{t - 7} =$

A. $\frac{1}{x - 7}$ B. $-\frac{3x^2}{x^3 - 7}$ C. $\frac{3x^2}{x^3 - 7}$ D. $\frac{x^3}{x^3 - 7}$

22. $\dfrac{d}{dx}\displaystyle\int_{x^3}^{7} \frac{dt}{t+4} =$

A. $\dfrac{1}{x+4}$ B. $\dfrac{3x^2}{x+4}$ C. $-\dfrac{3x^2}{x^3+4}$ D. $\dfrac{x^3}{x^3+4}$

23. Let $F(x) = \displaystyle\int_{1}^{5x+3} f(t)\,dt$ and $f(13) = 4$.

Find $F'(2)$ by using the Fundamental Theorem of Calculus:

$$\frac{d}{dx}\int_{a}^{b} f(t)\,dt = f(x)$$

A. 65 B. 20 C. 13 D. -65

24. If $F(x) = \displaystyle\int_{0}^{x^2+1} f(t)\,dt$ and $f(10) = 2$, then $F'(3) =$

A. 20 B. 30 C. 45 D. 60

25. The average value of $f(x) = 2x^2 - 1$ on the closed interval $[0, 3]$ is

A. $\frac{17}{3}$ B. 5 C. 45 D. 135

26. Find the average value of $f(x) = \sin x$ on the interval $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$.

A. $\dfrac{2\sqrt{2}}{\pi}$ B. $\dfrac{\sqrt{2}}{2}$ C. $\dfrac{\sqrt{2}}{\pi}$ D. $\dfrac{2}{\pi} - \sqrt{2}$

27. A projectile moves on the x-axis so that its position is $x(t) = -\frac{1}{2}\cos 2t + \frac{1}{2}$, where $t \geq 0$. For $0 \leq t \leq \frac{\pi}{2}$, find the average value of the position function.

A. $\frac{\pi}{4}$ B. $\frac{1}{2}$ C. 0 D. $\frac{2}{\pi}$

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1.
Answer: B

2.
Answer: C

3.
Answer: D

4.
Answer: 15.6

5.
Answer: B

6.
Answer: D

7.
Answer: A

8.
Answer: A

9.
Answer: B

10.
Answer: C

11.
Answer: D

12.
Answer: A

13.
Answer: B

14.
Answer: C

15.
Answer: C

16.
Answer: B

17.
Answer: 0, 1, 3, 9, 10.5, 9

18.
Answer: D

19.
Answer: B

20.
Answer: C

21.
Answer: C

22.
Answer: C

23.
Answer: B

24.
Answer: D

25.
Answer: B

26.
Answer: A

27.
Answer: B