Integrals and Fundamental Theorem of Calculus

1. $\int \frac{2x^5}{5}\,dx$

(A) $2x^4 + C$ (B) $\frac{2x^6}{5} + C$ (C) $\frac{12x^6}{5} + C$ (D) $\frac{x^6}{15} + C$

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2. $\int \frac{x^2 + 2x}{\sqrt{x^3 + 3x^2 + 7}}\,dx$

(A) $\frac{2}{3}\sqrt{x^3 + 3x^2 + 7} + C$ (B) $\frac{2}{3}\sqrt{3x^2 + 6x} + C$ (C) $\frac{1}{2\left(\sqrt{x^3+3x^2+7}\right)^3} + C$ (D) $\frac{\frac{1}{3}x^3+x^2}{\sqrt{\frac{1}{4}x^4+x^3+7x}} + C$

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3. $\int_{-2}^{1} \frac{x^2 + x}{x}\,dx$

(A) 3 (B) $\frac{3}{2}$ (C) 2 (D) non existent

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4. Let f be the function given by $f(x) = \int_{-1}^{x} \left(\frac{1}{2}t^4 - 16t + 7\right) dt$. What is the x-coordinate of the point of inflection of the graph of f ?

(A) -2 (B) 0 (C) 2 (D) 7

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5. $\int \frac{1}{x^2 + 10x + 25}\,dx =$

(A) $\arctan(x + 5) + C$ (B) $\frac{-1}{3(x+5)^3} + C$ (C) $\ln|x^2 + 10x + 25| + C$ (D) $\frac{-1}{x+5} + C$

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6. $\dfrac{d}{dx}\displaystyle\int_{1}^{\sin x} t\sqrt{t^2}\,dt$

(A) $\sin x \cos x \sqrt{\sin^2 x}$ (B) $\sin x \sqrt{\sin^2 x}$ (C) $-\sin x \cos x \sqrt{\sin^2 x}$ (D) $x\sqrt{x^2}$

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7. Let g be a continuous function such that $\displaystyle\int_{3}^{5} g(x)dx = 6$ and $\displaystyle\int_{3}^{10} g(x)dx = 24$.

Determine $\displaystyle\int_{3}^{5} (2g(x) - 4)dx$.

(A) -2 (B) 4 (C) 6 (D) 8

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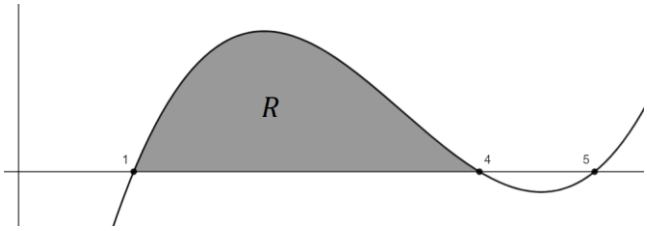
8. The region R bounded by $j(x)$, $x = 1, x = 4$, and the x-axis is shown. If the average value of $j(x)$ on the interval $(1, 4)$ is 18, what is the area of region R?

(A) 72 (B) 54 (C) 36 (D) 6



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9. Select the equivalent expression to the integral $\displaystyle\int x(x-1)^3 dx$.

(A) $\displaystyle\int u^3 du$ (B) $\displaystyle\int (u-1)u^3 du$ (C) $\displaystyle\int (u^3 - 1)du$ (D) $\displaystyle\int (u+1)u^3 du$

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10. $\displaystyle\int_{0}^{1} \frac{1}{e^x + 1} dx$

(A) $\ln(e+1) - \ln 2$ (B) $-\dfrac{1}{e} + 2$ (C) $1 - \ln(e+1) + \ln 2$ (D) $e - 2$

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11.

x	2	5	7	9	11	13	15	17	22
$f'(x)$	10	-3	5	9	16	7	-1	0	20

Selected values of l;kjark;l lkasjf modeling apodinw poijsnp pmown on the interval $2 \le x \le 22$ are shown.

(a) Use the data in the table to approximate $f''(10)$.

(b) Using a left Riemann sum, approximate the value of $\int_2^{11} f'(x)\,dx$ with the four subintervals indicated by the data in the table.

(c) Using a trapezoidal sum, approximate the value of $\int_2^{11} f'(x)\,dx$ with the four subintervals indicated by the data in the table.

(d) Using a midpoint sum, approximate the value of $\int_5^{17} f'(x)\,dx$ with three subintervals of equal length.

(e) apodinw poijsnp pmown can also be modeled by $R(x) = 0.05x^2 - \frac{1250}{x}\tan\left(\frac{x^2}{2200}\right)$ for $0 \le x \le 22$.

Find $\int_5^{22} R(x)\,dx$.

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