

1. $\int \left(5e^{2x} + \frac{1}{x} \right) dx =$

(A) $\frac{5}{2}e^{2x} + \frac{2}{x^2} + C$

(B) $\frac{5}{2}e^{2x} + \ln|x| + C$

(C) $5e^{2x} + \frac{2}{x^2} + C$

(D) $5e^{2x} + \ln|x| + C$

(E) $10e^{2x} - \frac{1}{x^2} + C$

$$\frac{5}{2}e^{2x} + \ln|x| + C$$

$$\int e^{ax+b} dx = \frac{1}{a} e^{ax+b}$$

2. If $f(x) = \sqrt{x} + \frac{3}{\sqrt{x}}$, then $f'(4) =$

- (A) $\frac{1}{16}$ (B) $\frac{5}{16}$ (C) 1 (D) $\frac{7}{2}$ (E) $\frac{49}{4}$

$$f'(x) = \frac{1}{2\sqrt{x}} - \frac{3}{2\sqrt{x^3}}$$

$$f'(4) = \frac{1}{4} - \frac{3}{16} = \frac{1}{16}$$

$$\begin{aligned} \frac{3}{\sqrt{x}} &= 3x^{-1/2} \\ &= \frac{3}{2}x^{-3/2} \end{aligned}$$

3. $\int x^2 (x^3 + 5)^6 dx =$

(A) $\frac{1}{3}(x^3 + 5)^6 + C$

(B) $\frac{1}{3}x^3 \left(\frac{1}{4}x^4 + 5x \right)^6 + C$

(C) $\frac{1}{7}(x^3 + 5)^7 + C$

(D) $\frac{3}{7}x^2 (x^3 + 5)^7 + C$

(E) $\frac{1}{21}(x^3 + 5)^7 + C$

$$u = x^3 + 5$$

$$du = 3x^2 dx$$

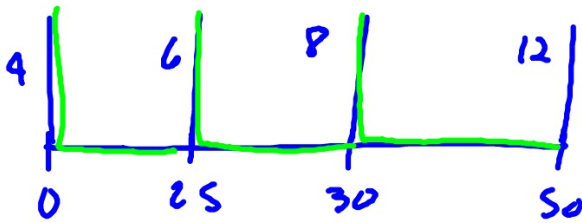
$$\frac{1}{3} du = x^2 dx$$

$$\begin{aligned} \frac{1}{3} \int u^6 du &= \frac{1}{3} \frac{1}{7} u^7 + C \\ &= \frac{1}{21} (x^3 + 5)^7 + C \end{aligned}$$

x	0	25	30	50
$f(x)$	4	6	8	12

4. The values of a continuous function f for selected values of x are given in the table above. What is the value of the left Riemann sum approximation to $\int_0^{50} f(x) dx$ using the subintervals $[0, 25]$, $[25, 30]$, and $[30, 50]$?

(A) 290 (B) 360 (C) 380 (D) 390 (E) 430



$$\begin{aligned}
 &4(25) + 6(5) + 8(20) \\
 &100 + 30 + 160 \\
 &290
 \end{aligned}$$

5. Let f be the function defined above, where c is a constant. For what value of c , if any, is f continuous at $x = 2$?

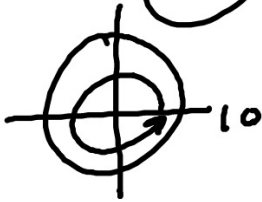
(A) 2

(B) 7

(C) 9

(D) $4\pi - 4$

(E) There is no such value of c .



$$f(x) = \begin{cases} x^2 \sin \pi x & x < 2 \\ x^2 + cx - 18 & x \geq 2 \end{cases}$$

$$4 \sin 2\pi = 4 + 2c - 18$$

$$0 = -14 + 2c$$

$$c = 7$$

6. Which of the following is an antiderivative of $3\sec^2 x + 2$?

(A) $3 \tan x$

(B) $3 \tan x + 2x$

(C) $3 \sec x + 2x$

(D) $\sec^3 x + 2x$

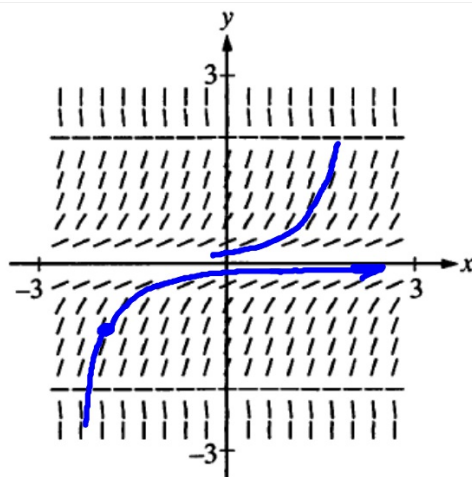
(E) $6 \sec^2 x \tan x$

$$3 \tan x + 2x$$

$$\left\{ \int \sec^2 x \, dx = \underline{\tan x} + C \right\}$$

7. If $f(x) = x^2 - 4$ and g is a differentiable function of x , what is the derivative of $f(g(x))$?
- (A) $2g(x)$ (B) $2g'(x)$ (C) $2xg'(x)$ (D) $2g(x)g'(x)$ (E) $2g(x) - 4$

$$\frac{f'(g(x))g'(x)}{f'(x) = 2x \quad 2g(x)g'(x)}$$
$$f'(g(x)) = 2g(x)$$



8. Shown above is a slope field for the differential equation $\frac{dy}{dx} = y^2(4 - y^2)$. If $y = g(x)$ is the solution to the differential equation with the initial condition $g(-2) = -1$, then $\lim_{x \rightarrow \infty} g(x)$ is
- (A) $-\infty$ (B) -2 (C) 0 (D) 2 (E) 3

9. If $f''(x) = x(x+2)^2$, then the graph of f is concave up for

- (A) $x < 0$
- (B) $x > 0$
- (C) $-2 < x < 0$
- (D) $x < -2$ and $x > 0$
- (E) all real numbers

$$f''(x) > 0$$

$$(x+2)^2 > 0$$

$$x > 0$$