

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

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

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

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) $\frac{49}{4}$

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

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

$$3x^{-1/2} \\ - \frac{3}{2}x^{-3/2}$$

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

$$u = x^3 + 5$$

$$du = 3x^2 dx$$

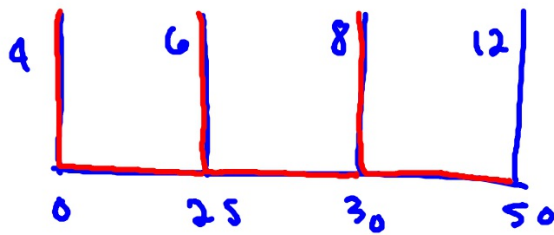
$$\frac{1}{3} du = x^2 dx$$

$$\frac{1}{3} \int u^6 du = \frac{1}{3} \frac{1}{7} u^7 + C$$

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) $4\pi - 4$

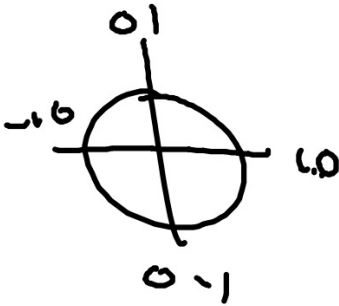
(E) There is no such value of c .

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

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

$$0 = -14 + 2c$$

$$c = 7$$



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

$$3 \tan x + 2x$$

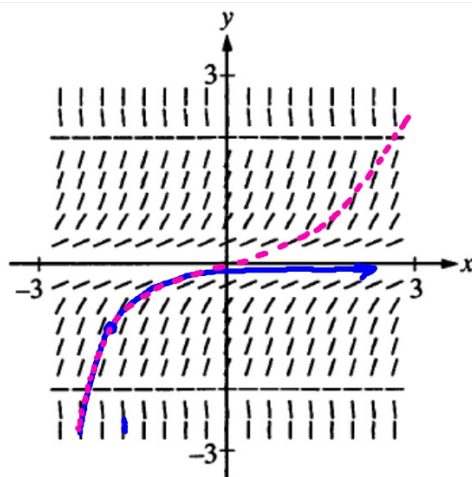
7. If $f(x) = x^2 - 4$ and g is a differentiable function of x , what is the derivative of $f(g(x))$?
- (A) $2g(x)$ (B) $2g'(x)$ (C) $2xg'(x)$ (D) $2g(x)g'(x)$ (E) $2g(x) - 4$

$$f'(g(x)) \underline{g'(x)}$$

$$f'(x) = 2x$$

$$f'(g(x)) = 2g(x)$$

$$2g(x)g'(x)$$



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

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

$$\underbrace{x}_{x > 0} \underbrace{(x+2)^2}_{+}$$

10. If $y = \sin x \cos x$, then at $x = \frac{\pi}{3}$, $\frac{dy}{dx} =$

(A) $-\frac{1}{2}$

(B) $-\frac{1}{4}$

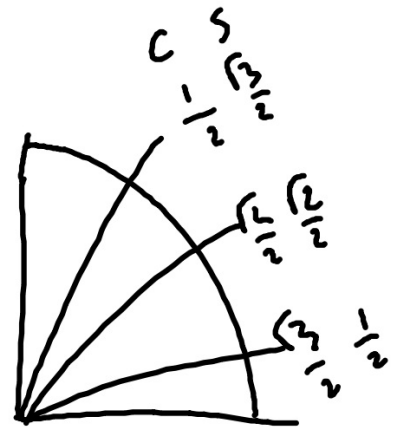
(C) $\frac{1}{4}$

(D) $\frac{1}{2}$

(E) 1

$-\frac{3}{4} + \frac{1}{4}$

$$\begin{aligned}\frac{dy}{dx} &= -\sin x \sin x + \cos x \cos x \\ &= -\sin^2 x + \cos^2 x\end{aligned}$$



$$\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2} \rightarrow \frac{3}{4}$$

$$\cos \frac{\pi}{3} = \frac{1}{2} \rightarrow \frac{1}{4}$$

