

1. if $y = 2 \sin^3(5x)$, find $\frac{dy}{dx}$.

A. $6 \sin^2(5x)$

B. $30 \sin^2(5x) \cos(5x)$

C. $-30 \sin^2(5x) \cos(5x)$

D. $6 \sin^2(5x) \cos(5x)$

E. $2 \cos^3(5x)$

2. If $f(x) = \sec(x) \tan(x)$, compute $f'(0)$.

A. 1

B. 0

C. -1

D. π

E. undefined

3. Determine the value of x .

$$\log_x \frac{1}{216} = -3$$

- A. $x = -3$
- B. $x = 6$
- C. $x = -6$
- D. $x = e$
- E. $x = 36$

4. Write the following expression as a sum, difference or multiple of logarithms.

$$\log_3 \frac{y^2}{\sqrt{3x}}$$

- A. $2\log_3 y + \log_3 \sqrt{3x}$
- B. $2\log_3 y + \frac{1}{2} - \frac{1}{2}\log_3 x$
- C. $2\log_3 y + \frac{1}{2}\log_3 x$
- D. $2\log_3 y - 2\log_3 \sqrt{3x}$
- E. $2\log_3 y - \frac{1}{2}\log_3 x - \frac{1}{2}$

5. If $f(x) = x^2 \ln x$ for all $x > 0$, which of the following is true?

- A. $f(x)$ is increasing for all $x > 0$
 - B. $f(x)$ is decreasing for all $x > 1$
 - C. $f(x)$ is increasing for all x between 0 and $\frac{1}{\sqrt{e}}$
 - D. $f(x)$ is increasing for all $x > \frac{1}{\sqrt{e}}$
 - E. $f(x)$ is decreasing for all $x > e$
6. A certain radioactive substance decays according to the law $N = 30e^{-0.04t}$ where N (in grams) is the amount present. Find the rate of change of N with respect to t when $t = 10.0$ years.

- A. -3.652×10^{-5}
- B. 20.110
- C. -502.740
- D. -0.804
- E. 9.130×10^{-4}

7. If $f(x) = e^{3x} \cos^2(3x)$, compute $f'(\frac{\pi}{3})$.

- A. $3e^\pi$
- B. 0
- C. e^π
- D. $6e^\pi$
- E. 1

8. If $g(x) = e^{2\sin(3x)}$, $0 \leq x \leq \pi$, for which of the following value(s) of x does $g(x)$ have relative minima?

- I. $x = \frac{\pi}{6}$
- II. $x = \frac{\pi}{2}$
- III. $x = \frac{5\pi}{6}$

- A. I only
- B. II only
- C. I and III only
- D. I and II only
- E. I, II, and III

9. $\int_0^{\pi/3} \cos(\theta) \sin^3(\theta) d\theta =$

- A. $\frac{9}{64}$
B. $\frac{\pi^4}{324}$
C. $-\frac{\pi^4}{324}$
D. $\frac{1}{64}$
E. $-\frac{7}{64}$

10. Which substitution should be used to evaluate $\int \frac{\sec^2(5x)}{\sqrt{\tan(5x) + 3}} dx$?

- A. $u = \tan(5x)$
B. $u = \sec^2(5x)$
C. $u = 5x$
 D. $u = \tan(5x) + 3$
E. $u = \sec(5x)$

11. $\int \frac{x+1}{x^2+2x+3} dx =$

A. $-\frac{2}{(x^2+2x+3)^{-2}} + C$

B. $2 \ln |x^2+2x+3| + C$

C. $(x^2+2x+3)^2 + C$

D. $-\frac{1}{2(x^2+2x+3)^{-2}} + C$

E. $\frac{1}{2} \ln |x^2+2x+3| + C$

12. Find the area of the region bounded by $y = \frac{2}{3-x}$, $x = 1$, and the coordinate axes.

A. $\ln \frac{2}{3}$

B. $\ln \frac{9}{4}$

C. 2

D. $\ln 36$

E. $\ln \frac{4}{9}$