

Lecture 19 Solutions

Solutions

1.

Find the integral:

$$\int x^{16} dx$$

$$\underline{\hspace{2cm}} + C$$

Solution:

Use the power rule with $n = 16$: $\int x^{16} dx = \frac{1}{17} x^{17} + C$

Correct answer is: $\frac{1}{17} x^{17} + C$

2.

Find the integral:

$$\int \frac{1}{\sqrt[9]{x}} dx$$

A. $\frac{8}{9} \sqrt[9]{x^8} + C$

B. $\frac{9}{8}x^9 + C$

C. $\frac{8}{9}x^9 + C$

D. $\frac{9}{8}\sqrt[9]{x^8} + C$

Solution:

Use the power rule with $n = -\frac{1}{9}$: Since $n + 1 = \frac{8}{9}$,

$$\int \frac{dx}{\sqrt[9]{x}} = \int x^{-1/9} dx = \frac{1}{8/9} x^{8/9} + C = \frac{9}{8} \sqrt[9]{x^8} + C$$

Correct answer is: D

3.

Find the integral:

$$\int e^{-5x} dx$$

Solution:

Use the exponential rule with $k = -5$:

$$\int e^{-5x} dx = \frac{1}{-5} e^{-5x} + C$$

Correct answer is: $-\frac{1}{5} e^{-5x} + C$

4.

Find the following integral:

$$\int (2x^3 + 9x^2 - 2x + 4) dx$$

_____ + C

Solution:

By using the power rule in conjunction with the sum and difference rules and the multiple rule, you get

$$\begin{aligned} \int (2x^3 + 9x^2 - 2x + 4) dx &= 2 \int x^3 dx + 9 \int x^2 dx - 2 \int x dx + \int 4 dx \\ &= 2 \left(\frac{x^4}{4} \right) + 9 \left(\frac{x^3}{3} \right) - 2 \left(\frac{x^2}{2} \right) + 4x + C \\ &= \frac{1}{2} x^4 + 3x^3 - x^2 + 4x + C \end{aligned}$$

Correct answer is: $\frac{1}{2} x^4 + 3x^3 - x^2 + 4x + C$

5.

Find the indicated integral.

$$\int \left(\sqrt{x^{17}} - \frac{1}{2\sqrt{x}} + \sqrt{3} \right) dx$$

_____ + C

Solution:

$$= \int \left(x^{17/2} - \frac{1}{2}x^{-1/2} + \sqrt{3} \right) dx$$

$$= \frac{2}{19}x^9 \sqrt{x} - \sqrt{x} + \sqrt{3}x + C$$

Correct answer is: $\frac{2x^9}{19} \sqrt{x} - \sqrt{x} + \sqrt{3}x + C$

6.

The slope $f'(x)$ at each point (x, y) on a curve $y = f(x)$ is given along with a particular point (a, b) on the curve. Use this information to find $f(x)$.

$$f'(x) = 3x^2 + 10x - 4; (0, 2)$$

Solution:

$$f(x) = \int f'(x) dx$$

$$= \int 3x^2 + 10x - 4 dx$$

$$= x^3 + 5x^2 - 4x + C$$

$$f(0) = 0 + 0 + 0 + C = 2 \Rightarrow C = 2$$

$$f(x) = x^3 + 5x^2 - 4x + 2$$

Correct answer is: $x^3 + 5x^2 - 4x + 2$

7.

Find the integral:

$$\int (11e^{-6t} + 8\sqrt{t}) dt$$

A. $-\frac{11}{6}e^{-6t} + \frac{16}{3}t^{3/2} + C$

B. $\frac{11}{6}e^{-6t} - 16t^{-1/2} + C$

C. $-\frac{11}{6}e^{-6t} - 16t^{-1/2} + C$

D. $\frac{11}{6}e^{-6t} + \frac{16}{3}t^{3/2} + C$

Solution:

$$\begin{aligned} \int (11e^{-6t} + 8\sqrt{t}) dt &= \int (11e^{-6t} + 8t^{1/2}) dt \\ &= 11\left(\frac{1}{-6}e^{-6t}\right) + \frac{8}{3/2}t^{3/2} + C \\ &= -\frac{11}{6}e^{-6t} + \frac{16}{3}t^{3/2} + C \end{aligned}$$

Correct answer is: A
