

More Integration Practice

Determine the value of each limit.

1. $\lim_{x \rightarrow -2} \frac{x^2 - x - 6}{x + 2}$

2. $\lim_{c \rightarrow 0} \frac{\sin c}{c}$

3. $\lim_{\Delta x \rightarrow 0} \frac{\sin\left(\Delta x + \frac{\pi}{2}\right) - 1}{\Delta x}$

Compute each indefinite integral.

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

5. $\int x^2(x^3 - 1)^4 dx$

6. $\int \sqrt{9 - x^2} (-2x) dx$

7. $\int \frac{x^2}{(1 + x^3)^2} dx$

8. $\int 5x^3 \sqrt{1 - x^2} dx$

9. $\int (\tan^4 x \sec^2 x) dx$

10. $\int \frac{1}{\theta^2} \cos \frac{1}{\theta} d\theta$

11. $\int \frac{x^2 + 2x + 3}{x^3 + 3x^2 + 9x} dx$

12. $\int x e^{-3x^2} dx$

13. $\int x \sqrt{x + 2} dx$ answer: $\frac{2}{5}(x+2)^{\frac{5}{2}} - \frac{4}{3}(x+2)^{\frac{3}{2}} + c$

14. $\int (x+1)\sqrt{2-x} dx$

answer: $-2(2-x)^{\frac{3}{2}} + \frac{2}{5}(2-x)^{\frac{5}{2}} + c$

Evaluate each definite integral. (No calculator)

15. $\int_{-1}^1 x(x^2 + 1)^3 dx$

16. $\int_0^{\frac{\pi}{2}} \cos\left(\frac{2x}{3}\right) dx$

17. $\int_{\frac{\pi}{2}}^{\frac{2\pi}{3}} \sec^2\left(\frac{x}{2}\right) dx$

18. $\int_0^7 x\sqrt[3]{x+1} dx$ *A calculator may be used for arithmetic.*

19. $\int_0^4 \frac{5}{3x+1} dx$

20. $\int_1^3 \frac{e^{\frac{3}{x}}}{x^2} dx$ *answer: $-\frac{1}{3}(e^1 - e^3)$*

A calculator is allowed for all computations on the following problems.

21. The rate at which water enters a tank is given by $R(t) = \sin(2t - 4) + 8$, where water is measured in thousands of gallons and time is measured in hours.

a) Determine the average rate of change for the rate of water entering the tank from $t = 1$ to $t = 3$.

Use correct units and show all work that leads to your answer.

b) Determine how much water has entered the tank from $t = 1$ to $t = 3$.

Use correct units and show all work that leads to your answer.

c) Determine the average rate at which water is entering the tank from $t = 1$ to $t = 3$.

Use correct units and show all work that leads to your answer.