Integration Practice Problems for AP Calculus

by William Ma

Review the following concepts if needed:

- Evaluating Basic Integrals for AP Calculus
- Integration by U-Substitution for AP Calculus
- Techniques of Integration for AP Calculus

Evaluate the following integrals in problems 1 to 20. No calculators are allowed. (However, you may use calculators to check your results.)

1. $\int (x^5 + 3x^2 - x + 1)dx$
2. $\int \left(\sqrt{x} - \frac{1}{x^2}\right) dx$
3. $\int x^3 (x^4 - 10)^5 dx$
4. $\int x^3\sqrt{x^2+1}\, dx$
5. $\int \frac{x^2+5}{\sqrt{x-1}}\, dx$
6. $\int \tan\left(\frac{x}{2}\right) dx$
7. $\int x \csc^2(x^2)dx$
8. $\int \frac{\sin x}{\cos^3 x} dx$
9. $\int \frac{1}{x^2+2x+10} dx$
10. $\int \frac{1}{x^2}\sec^2\left(\frac{1}{x}\right) dx$
11. $\int (e^{2x})(e^{4x})dx$
12. $\int \frac{1}{x \ln x} dx$
13. $\int \ln(e^{5x+1})dx$

14. $\int \frac{e^{4x}-1}{e^x}dx$
15. $\int (9-x^2)\sqrt{x}\,dx$
16. $\int \sqrt{x}\left(1+x^{3/2}\right)^4 dx$
17. If $\frac{dy}{dx} = e^x + 2$ and the point (0, 6) is on the graph of y, find y.
18. $\int -3e^x \sin(e^x)\,dx$
19. $\int \frac{e^x - e^{-x}}{e^x + e^{-x}}dx$
20. If $f(x)$ is the antiderivative $\frac{1}{x}$ of and $f(1) = 5$, find $f(e)$.
21. $\int x^2\sqrt{1-x}\,dx$
22. $\int 3x^2 \sin x\,dx$
23. $\int \frac{x\,dx}{x^2-3x-4}$
24. $\int \frac{dx}{x^2+x}$
25. $\int \frac{\ln x}{(x+5)^2}dx$

(Calculator) indicates that calculators are permitted.

26. The graph of the velocity function of a moving particle for $0 \le t \le 10$ is shown in Figure 10.6-1.

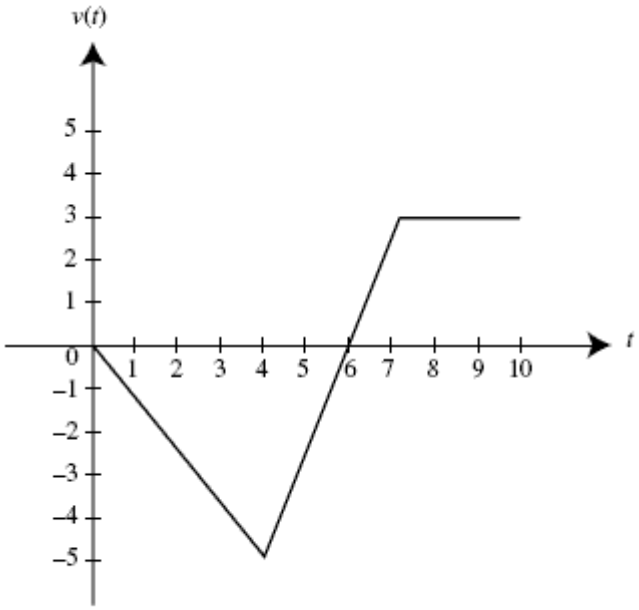


Figure 10.6-1

a. At what value of t is the speed of the particle the greatest?
b. At what time is the particle moving to the right?

27. Air is pumped into a spherical balloon, whose maximum radius is 10 meters. For what value of r is the rate of increase of the volume a hundred times that of the radius?

28. Evaluate $\int \frac{\ln^3(x)}{x} dx.$

29. (Calculator) The function f is continuous and differentiable on (0, 2) with $f''(x) > 0$ for all x in the interval (0, 2). Some of the points on the graph are shown below.

x	0	0.5	1	1.5	2
$f(x)$	1	1.25	2	3.25	5

Which of the following is the best approximation for $f'(1)$?

a. $f'(1) < 2$
b. $0.5 < f'(1) < 1$
c. $1.5 < f'(1) < 2.5$
d. $2.5 < f'(1) < 3.5$
e. $f'(1) > 2$

30. The graph of the function f'' on the interval [1, 8] is shown in Figure 10.6-2. At what value(s) of t on the open interval (1, 8), if any, does the graph of the function f':

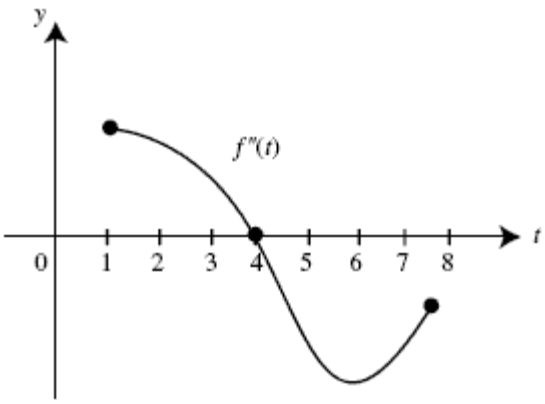


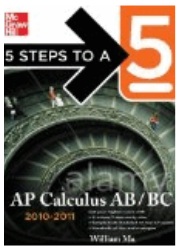
Figure 10.6-2

a. have a point of inflection?
b. have a relative maximum or minimum?
c. concave upward?

31. Evaluate $\lim_{x \to -2} \frac{x^2 - x - 6}{x^2 - 4}$.
32. If the position of an object is given by $x = 4 \sin(\pi t)$, $y = t^2 - 3t + 1$, find the position of the object at $t = 2$.
33. Find the slope of the tangent line to the curve $r = 3 \cos \theta$ when $\theta = \frac{\pi}{4}$.

Solutions for these practice problems can be found at: Solutions to Integration Practice Problems for AP Calculus

Related Books



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