

You may use your calculators on this part of the test ... but make sure you show your mathematics!

1. Use the trapezoid rule with $n = 4$ to estimate the value of $\int_2^5 \frac{1}{x+3} dx$.
2. Use the trapezoid rule with $n = 4$ to estimate the value of $\int_1^6 \frac{x}{x+2} dx$.
3. Find the exact area of the region bounded by $f(x) = x^2 - 1$ from $x = 2$ to $x = 4$ using a limit of a Riemann sum.
4. Find the exact area of the region bounded by $f(x) = x^2 + 3$ from $x = 1$ to $x = 5$ using a limit of a Riemann sum.
5. Find the approximate area under $f(x) = x^2 + 3$ from $x = 1$ to $x = 5$ using 4 subdivisions and a right Riemann sum.
6. Find the approximate area under $f(x) = x^2 - 2$ from $x = 3$ to $x = 7$ using 4 subdivisions and a left Riemann sum.
7. Find the approximate area under $f(x) = x^2 + 1$ from $x = 1$ to $x = 6$ using 5 subdivisions and a midpoint Riemann sum.
8. Find the approximate area under $f(x) = x^2 + 2$ from $x = 1$ to $x = 5$ using 4 subdivisions and a midpoint Riemann sum.
9. Set up, but do not evaluate, the limit of a Riemann sum you would use to find the exact of $\int_1^4 x^2 dx$.
10. Set up, but do not evaluate, the limit of a Riemann sum you would use to find the exact of $\int_0^4 (x^2 + x) dx$.
11. Given $\int_1^9 f(x) dx = 15$ and $\int_1^5 f(x) dx = 3$, find $\int_5^9 f(x) dx$.
12. Given $\int_2^7 f(x) dx = 8$ and $\int_2^4 f(x) dx = 2$, find $\int_4^7 f(x) dx$.
13. Given $\int_0^8 f(x) dx = 30$ and $\int_0^6 f(x) dx = 20$, find $\int_6^8 [3f(x) - 5] dx$.
14. Given $\int_0^7 f(x) dx = 30$ and $\int_0^4 f(x) dx = 17$, find $\int_4^7 [5f(x) - 6] dx$.
15. Given $\int_a^b p(x) dx = 11a - 6b$, find $\int_a^b [6p(x) + 2] dx$.
16. Given $\int_a^b h(x) dx = 10a - 7b$, find $\int_a^b [3h(x) + 7] dx$.

You may NOT use your calculator in this part of the test. Simplify all answers including common denominators.

17. $\int_{-7}^2 |x+3| dx$

$$18. \int_{-5}^5 |2x - 1| dx$$

$$19. \int_{-3}^1 \frac{1}{(3 - 2x)^2} dx$$

$$20. \int_0^3 \frac{1}{5x + 3} dx$$

$$21. \int_0^{\pi} \cos^3 x \sin x dx$$

$$22. \int_0^{2\pi} \sin^2 x \cos x dx$$

$$23. \int_1^4 \frac{1}{(1 + \sqrt{x})^3} \frac{1}{\sqrt{x}} dx$$

$$24. \int_{\ln 2}^{\ln 3} \frac{e^{2x}}{1 + e^{2x}} dx$$

$$25. \int_0^1 \frac{x}{x + 1} dx$$

$$26. \int_0^2 e^{\ln x^3} dx$$

$$27. \int_1^3 \ln e^{\sin x} dx$$

$$28. \frac{d}{dx} \int_{x^2}^{\sin x} \sec t dt$$

$$29. \frac{x}{dx} \int_{e^x}^{x^4} \ln t dt$$

$$30. \text{ Given } F(x) = \int_3^x (3t^2 - 5) dt \text{ find } F(3), F'(3) \text{ and } F''(3).$$

$$31. \text{ Given } F(x) - 2 = \int_2^x \frac{1}{t - 5} dt \text{ find } F(2), F'(2) \text{ and } F''(2).$$

Answers (not complete solutions)

1. .471

2. 3.014

3. $\frac{50}{3}$

4. 53.333

5. 66

6. 78

7. 76.250

8. 49

9. $\lim_{x \rightarrow \infty} \sum_1^n \left[\frac{3}{n} + \frac{18}{n^2} i + \frac{27}{n^3} i^2 \right]$

10. $\lim_{x \rightarrow \infty} \sum_1^n \left[\frac{64}{n^3} i^2 + \frac{16}{n^2} i \right]$

11. 12

12. 6

13. 20

14. 47

15. $64a - 34b$

16. $23a - 14b$

17. $\frac{41}{2}$

18. $\frac{101}{2}$

19. $-\frac{4}{9}$

20. $\frac{\ln 6}{5}$

21. 0

22. 0

23. $\frac{5}{36}$

24. $\frac{\ln 2}{2}$

25. $1 - \ln 2$

26. 4

27. $\cos 1 - \cos 3$

28. $[\sec(\sin x)](\cos x) - [\sec x^2](2x)$

29. $16x^3 \ln x - xe^x$

30. $F(3) = 0$

$F'(3) = 22$

$F''(3) = 18$

$$31. \begin{aligned} F(2) &= 2 \\ F'(2) &= -\frac{1}{3} \\ F''(2) &= -\frac{1}{9} \end{aligned}$$