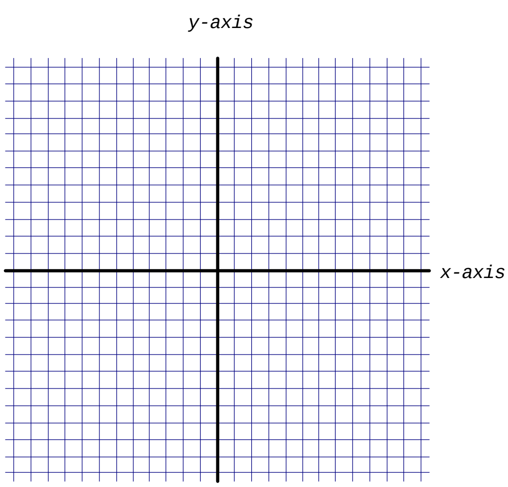
1. Verify that the hypotheses of Rolle's Theorem are satisfied on the interval of $[-2, \frac{1}{3}]$, and find all values of c in that interval that satisfy the conclusion of the theorem.
   $f(x) = 3x^2 + 5x - 2$

2. Verify that the hypotheses of the Mean-Value Theorem are satisfied on the given interval, and find all values of c in that interval that satisfy the conclusion of the theorem.
   $f(x) = x^2 - 2x + 5 \;\; on \;\; [-1, 8].$

3. Use simple area formulas from geometry to find the area function $A(x)$ that gives the area between the graph of $f(x) = x - 5$ and the interval $[5, x]$. Confirm that $A'(x) = f(x)$.



Evaluate the integral.

4. $\int \left(x^{-2} + \sqrt[3]{x^2} \right) dx$

5. $\int \frac{7}{\csc x}\, dx$

6. $\int \frac{x^5 - 8x + 3}{x}\, dx$

7. $\int 10\, dx$

8. $\int \frac{2}{x\sqrt{x^2-9}}\, dx$

9. $\int \frac{dx}{25+4x^2}$

10. $\int \frac{dx}{x\sqrt{2x}}$

11. Solve the initial-value problem. $\frac{dy}{dx} = 3x^2\sqrt{1+x^3}$ $y(0)=1$

Evaluate the integral.

12. $\int \frac{3\,dx}{\sqrt{(x-1)^3}}$ Let $u = x - 1$

13. $\int_0^{\frac{1}{2}} \frac{dx}{\sqrt{1-x^2}}$

14. $\int \frac{x\ dx}{\sqrt{4-x^2}}$ Let $u = 4 - x^2$

15. $\int \frac{dx}{\sqrt{4-x^2}}$

16. $\int_{-\frac{p}{4}}^{\frac{p}{4}} \tan^2 x \sec^2 x\ dx$ Let $u = \tan x$

17. $\int \frac{\sin(\ln x)}{x}\, dx$ Let $u = \ln x$

18. $\int_0^1 (e^x + 1)\ dx$

19. $\int (\ln x)^2\ \frac{dx}{x}$

20. $\int e^{\frac{x}{3}}\, dx$

21. $\int \frac{dx}{\sqrt{x}\,(1+x)}$ Let $u = \sqrt{x}$

22. Evaluate:

a) $\sum_{k=4}^{9} (5k - 10)$

b) $\sum_{k=3}^{100} p$

23. $3 + \frac{3}{4} + \frac{3}{9} + \frac{3}{16} + \frac{3}{25} + \frac{3}{36}$ in sigma notation, but do not evaluate.

$$\sum_{k=1}^{n} k = \frac{n(n+1)}{2} \qquad \sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6} \qquad \sum_{k=1}^{n} k^3 = \left[\frac{n(n+1)}{2}\right]^2$$

24. Evaluate: $\sum_{k=1}^{30} (k+2)(k+4)$

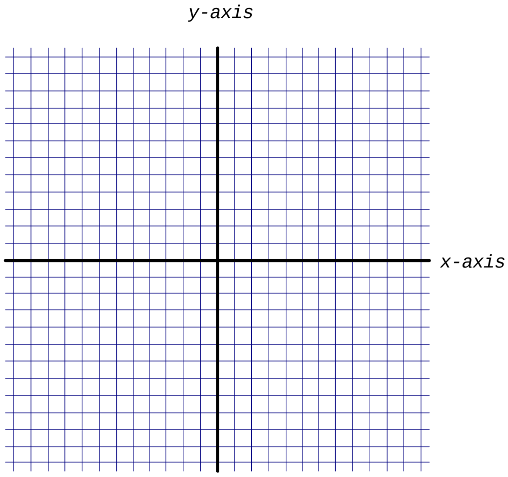
25. Express $\sum_{k=1}^{n} \frac{12k^3}{n+1}$ in closed form.

26. Find: $\frac{d}{dx} \int_0^x \sqrt{1+t^2}\, dt$

27. Use the definition of the area under the curve to find the area under $f(x) = x^2 + 2x + 4$ from $a = 0$ to $b = 2$

28. Sketch the area whose signed area is represented by the definite integral, and evaluate the integral using an appropriate formula from geometry.

$$\int_1^3 (2x + 5)\, dx$$



Sketch your answer by evaluating the integral.

29. Find the area under the curve $f(x) = \frac{1}{x}$ *from* $[2,\ 12]$.

30. A particle moves along an s-axis. Find the position function of the particle if $v(t) = 6t^2 + 8t - 3$; $s(0) = 15$

31. A particle moves with a velocity of $v(t) = 3t^2 - 12$ meters/seconds along an s-axis. Find the displacement and the distance traveled by the particle during the time interval of $0 \le t \le 5$.

32. When Joe shot a marble straight upward from ground level with his slingshot, it reached a maximum height of 400 feet. What was the marble's initial velocity?

33. Joe drops a stone into a well. It hits the bottom 3 seconds later. How deep is the well?

34. Find the average value of the function $f(x) = 9x^2 + 2x$ over $[1,5]$.