

Simplify the radical expressions

1. $\frac{4}{\sqrt{3}}$

2. $\sqrt{\frac{8}{5}}$

3. $\sqrt[3]{\frac{5}{2}}$

4. $\sqrt{4x^2y}$

5. $\sqrt[3]{81x^4y^5}$

6. $\frac{3-\sqrt{2}}{1+3\sqrt{5}}$

7. $\frac{x-3}{x-\sqrt{3}}$

Expand and simplify

8. $(3x-2)(5x+7)$

9. $(1-x^{-1})(2+5x)$

10. $1+(x^3-x^{-3})^2$

11. $(3x-2)^3$

Simplify the expressions

12. $\frac{8x^3+5x^2-3x^{-1}}{4x}$

13. $\frac{x^2-5x+6}{x-3}$

14. $\frac{5(x-2)^2-4x(x-2)}{(x-2)^3}$

15. $(3x^2y^{-1})^4$

16. $(2x^{-3}y^2)^{-2}(5xy^{-3})^3$

17. $\frac{8x^{1/3}y^{9/5}}{3x^{4/3}y^{2/5}}$

18. $\frac{4t^{9/4}s^{3/5}}{5t^{1/3}s^{-1/4}}$

Evaluate and simplify

19. $\frac{5 \pm \sqrt{(-5)^2 - 4(3)(-2)}}{2(3)}$

20. $2x^2(3x-1)\sqrt{5x-1}\Big|_{x=2}$

21. $4x^{3/4}(x-1)^2\Big|_{x=16}$

Factor completely

22. $10x^3 - 13x^2 - 3x$

23. $10x^3 - 13x^2 + 3x$

24. $4x^{7/3} - 2x^{4/3} - 12x^{1/3}$

25. $3x^4 - 5x^3 - 12x^2 + 20x$

26. $8x^3 - 27$

27. $2x^3 + 7x^2 - 14x + 5$

Hint: Find one root and then use synthetic division.

28. $x^4 - 3x^3 - 4x^2 - 3x - 5$

Hint: graph, approximate the roots numerically, and work backwards to find two of the roots. Then use polynomial division to find the other factor(s).

Use the table to evaluate

x	-2	-1	0	1	2
$f(x)$	3	2	-1	2	0
$g(x)$	2	1	5	-2	-1

29. $(f + g)(-2)$

30. $(fg)(0)$

31. $f[g(1)]$

32. $(g \circ f)(1)$

33. $f^2(5x - 2)|_{x=0}$

34. $x^2 f(3x + 2) g(1 - x)|_{x=-1}$

Find all real solutions

35. $(x - 2)^2 (3x - 1)^3 (5x^2 - 9)(x^2 + 4) = 0$

36. $(x + 3)^{1/2} (3x + 1)^{-2} (x + 7)^3 (5x - 3)^{1/3} = 0$

Piecewise Functions

Evaluate each of the following when $f(x) = \begin{cases} 3x - 5, & x < 3 \\ x^2 - 9 & x > 3 \end{cases}$

37. $f(2)$

38. $f(3)$

39. $f(4)$

Simplify by factoring

40. $(3x+2)^2(5x-1)^5 + (3x+2)^3(5x-1)^4$

41. $24x(3x^2-1)^3(4x+3)^3 + 12(3x^2-1)^4(4x+3)^2$

42. $\frac{32}{3}(3x-1)^{5/4}(4x+3)^{5/3} + \frac{15}{4}(3x-1)^{1/4}(4x+3)^{8/3}$

43. $\frac{9}{4}(2x+1)^{1/3}(3x+2)^{-1/4} + \frac{2}{3}(2x+1)^{-2/3}(3x+2)^{3/4}$

44.
$$\frac{10(3x-4)^3(5x+3) - 9(5x+3)^2(3x-4)^2}{(3x-4)^6}$$

Trigonometric Identities

There are two angles, x and y , such that $\sin x = \frac{3}{5}$, $\tan y = -\frac{12}{5}$, $0 < x < \frac{\pi}{2}$, and $\frac{\pi}{2} < y < \pi$. Draw two appropriate triangles and use them to find the following.

45. $\cos x$

49. $\sin 2y$

53. $\sin x \sec y$

46. $\sin(\pi - x)$

50. $\cos(y - x)$

54. $\sec(\pi + x)$

47. $\tan(x - y)$

51. $\sin(x + y)$

55. $\cot(-y)$

48. $\cos^2\left(\frac{x}{2}\right)$

52. $\cos^2(5x) + \sin^2(5x)$

56. $\sec^2 y + \csc^2 x$

Manipulate and Evaluate

All of these problems are of the form $0/0$ when you try to evaluate them using direct substitution at the indicated point. Algebraically manipulate the expression to eliminate the 0 from the denominator and then evaluate it at the indicated point.

$$57. \frac{5x}{x^2 + 2x}, x = 0$$

$$58. \frac{5x^2 - 13x - 6}{x - 3}, x = 3$$

$$59. \frac{(x+h)^5 - x^5}{h}, h = 0$$

$$60. \frac{\sqrt{x+4} - 3}{x-5}, x = 5$$

$$61. \frac{\sqrt{x+h} - \sqrt{x}}{h}, h = 0$$

$$62. \frac{\frac{3}{x} - \frac{3}{4}}{x-4}, x = 4$$

$$63. \frac{1 - \cos x}{\sin x}, x = 0$$