

PEMDAS

Show your work and answer the questions completely. Simplify your answers completely. Credit may not be given for an answer alone.

Use the properties of exponents to evaluate or simplify the expression.

1. $3b^5 \cdot 7b^3$
 $3 \cdot 7 \cdot b^5 \cdot b^3$
 $21b^{5+3}$
 $21b^8$

2. $\left(\frac{x^7 y^2}{z^4}\right)^3$
 $\frac{(x^7)^3 (y^2)^3}{(z^4)^3} = \frac{x^{21} y^6}{z^{12}}$

3. $\left(x \frac{14}{2}\right)^{\frac{2}{7}}$
 $x^{\frac{14}{2} \cdot \frac{2}{7}} = x^{\frac{28}{14}} = x^2$

4. $\frac{(u^{-3} v^3)^2}{u^3 v}$
 $\frac{(u^{-3})^2 (v^3)^2}{u^3 v} = \frac{u^{-6} v^6}{u^3 v} = \frac{v^6}{u^6 u^3 v} = \frac{v^6}{u^9 v}$
 $= \frac{v^{6-1}}{u^{6+3}} = \frac{v^5}{u^9}$

5. $\frac{9a^2 b^7}{2a^5 b^4}$
 $\frac{9a^{2-5} b^{7-4}}{2} = \frac{9a^{-3} b^3}{2} = \frac{9b^3}{2a^3}$

6. $(2w^3)^2 \cdot w^4$
 $2^2 (w^3)^2 w^4$
 $4w^6 w^4$
 $4w^{6+4} = 4w^{10}$

7. $\left(\frac{3x^3 y^{17}}{6xy}\right)^5$
 $\left(\frac{3x^{3-1} y^{17-1}}{2}\right)^5 = \left(\frac{x^2 y^{16}}{2}\right)^5$
 $\frac{(x^2)^5 (y^{16})^5}{2^5} = \frac{x^{10} y^{80}}{32}$

8. $\frac{5}{a^{\frac{2}{3}}} \cdot \frac{1}{a^{\frac{1}{3}}}$
 $= a^{\frac{3}{3} \cdot \frac{5}{2}} - \frac{1}{3} \cdot \frac{2}{2}$
 $a^{\frac{15}{6}} - \frac{2}{6}$
 $a^{\frac{13}{6}}$

9. $x^{\frac{3}{7}} \cdot x^{\frac{1}{2}}$
 $x^{\frac{3}{7} + \frac{1}{2} \cdot \frac{7}{7}}$
 $x^{\frac{6}{14} + \frac{7}{14}}$
 $x^{\frac{13}{14}}$

Convert each expression from either exponent or radical notation or radical to exponent notation.

10. $\sqrt[3]{x}$
 $x^{1/3}$

11. $(\sqrt[6]{3})^5$
 $3^{5/6}$

12. $y^{2/3}$
 $(\sqrt[3]{y})^2$ or $\sqrt[3]{y^2}$

13. $5^{\frac{2}{3}}$
 $\sqrt[3]{5^2}$ or $(\sqrt[3]{5})^2$

Simplify the following expressions.

14. $\sqrt[3]{-81}$
 $\sqrt[3]{-3 \cdot 3 \cdot 3 \cdot 3}$
 $-3 \sqrt[3]{3}$

15. $\sqrt{72x^5 y^6}$
 $\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot x \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y}$
 $6x^2 y^3 \sqrt{2x}$

16. $\sqrt[4]{64n^9 m^8}$
 $\sqrt[4]{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot n \cdot n \cdot n \cdot n \cdot n \cdot n \cdot n \cdot n \cdot n \cdot m \cdot m \cdot m \cdot m \cdot m \cdot m \cdot m \cdot m \cdot m}$
 $2n^2 m^2 \sqrt[4]{4n}$

Solve the following equations.

17. $\sqrt{8x-4} - 2 = 4$
 $\sqrt{8x-4} = 6$
 $8x-4 = 36$
 $8x = 40$
 $x = 5$

18. $2\sqrt{x+1} + 2 = 20$
 $2\sqrt{x+1} = 18$
 $\sqrt{x+1} = 9$
 $x+1 = 81$
 $x = 80$

19. $(x-5)^{1/3} = 3$
 $(\sqrt[3]{x-5})^3 = (3)^3$
 $x-5 = 27$
 $x = 32$

Simplify the following complex expressions. Make sure your answer is in standard form.

20. $(9 + 10i) - (-6 + 4i)$

$$9 + 10i + 6 - 4i$$

$$\boxed{15 + 6i}$$

21. $(7 + 8i) + (4 - 2i)$

$$7 + 8i + 4 - 2i$$

$$\boxed{11 + 6i}$$

$a + bi$

22. $6i(4 + 3i)$

$$24i + 18i^2$$

$$24i + 18(-1)$$

$$\boxed{-18 + 24i}$$

23. $(5 - 2i)(4 + i)$

$$20 + 5i - 8i - 2i^2$$

$$20 - 3i - 2(-1)$$

$$20 - 3i + 2$$

$$\boxed{22 - 3i}$$

24. $(3 + 4i)(3 - 4i)$

$$9 - 12i + 12i - 16i^2$$

$$9 - 16(-1)$$

$$9 + 16$$

$$\boxed{25}$$

25. $(1 + 2i)^2 = (1 + 2i)(1 + 2i)$

$$1 + 2i + 2i + 4i^2$$

$$1 + 4i + 4(-1)$$

$$1 + 4i - 4$$

$$\boxed{-3 + 4i}$$

Given the following functions, perform the indicated operation and simplify.

$f(x) = x^2 + 1$	$g(x) = x + 3$	$h(x) = x^2 - 2x + 4$	$k(x) = -7x^{1/3}$
$n(x) = 12x^{1/3}$	$p(x) = x^{1/4}$	$q(x) = \sqrt[3]{x}$	$r(x) = 8\sqrt[3]{x^2}$

26. $f(2)$

$$f(x) = x^2 + 1$$

$$f(2) = (2)^2 + 1$$

$$= 4 + 1$$

$$= \boxed{5}$$

27. $p(16) + k(8)$

$$p(x) = x^{1/4} \quad k(x) = -7x^{1/3}$$

$$p(16) = 16^{1/4} \quad k(8) = -7(8^{1/3})$$

$$= \sqrt[4]{16} \quad = -7(\sqrt[3]{8})$$

$$= 2 \quad = -7(2)$$

$$= -14$$

$$p(16) + k(8) = 2 + (-14) = \boxed{-12}$$

28. $h(1) - q(27)$

$$h(x) = x^2 - 2x + 4 \quad q(x) = \sqrt[3]{x}$$

$$h(1) = 1^2 - 2(1) + 4 \quad q(27) = \sqrt[3]{27}$$

$$= 1 - 2 + 4 \quad = 3$$

$$= 3$$

$$h(1) - q(27) = 3 - 3 = \boxed{0}$$

29. $f(x) \cdot g(x)$

$$(x^2 + 1)(x + 3)$$

$$\boxed{x^3 + 3x^2 + x + 3}$$

30. $h(x) - g(x)$

$$(x^2 - 2x + 4) - (x + 3)$$

$$x^2 - 2x + 4 - x - 3$$

$$\boxed{x^2 - 3x + 1}$$

31. $k(x) + n(x)$

$$-7x^{1/3} + 12x^{1/3}$$

$$\boxed{5x^{1/3}}$$

32. $(np)(x)$

$$= n(x) \cdot p(x)$$

$$= (12x^{1/3})(x^{1/4})$$

$$= 12x^{1/3} \cdot x^{1/4}$$

$$= 12x^{\frac{1}{3} + \frac{1}{4} \cdot \frac{3}{3}}$$

$$= 12x^{\frac{4}{12} + \frac{3}{12}}$$

$$= \boxed{12x^{\frac{7}{12}}}$$

33. $q(x) \cdot r(x)$

$$= (\sqrt[3]{x})(8\sqrt[3]{x^2})$$

$$= (x^{1/3})(8x^{2/3})$$

$$= 8x^{1/3} \cdot x^{2/3}$$

$$= 8x^{\frac{1}{3} + \frac{2}{3}}$$

$$= 8x^{\frac{3}{3}}$$

$$= \boxed{8x}$$

34. $p(x) \cdot q(x)$

$$= (x^{1/4})(\sqrt[3]{x})$$

$$= (x^{1/4})(x^{1/3})$$

$$= x^{\frac{1}{4} + \frac{1}{3} \cdot \frac{4}{4}}$$

$$= x^{\frac{3}{12} + \frac{4}{12}}$$

$$= \boxed{x^{\frac{7}{12}}}$$