

Simplify the radical:

1. $\sqrt[4]{162a^2b^{16}c^5}$
 $\sqrt[4]{2 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot a^2 b^4 c^5}$
 $3b^4c \sqrt[4]{a^2c}$

2. $\sqrt{1500a^9b^2c^7}$
 $15 \cdot 100$
 $10a^4bc^3 \sqrt{15ac}$

3. $\sqrt[3]{567a^{24}b^5c^{10}}$
 $3 \cdot 3 \cdot 3 \cdot 3 \cdot 7 \cdot a^{24} b^5 c^{10}$
 $3a^8bc^3 \sqrt[3]{21b^2c}$

4. $\sqrt[5]{243a^6b^5c^{11}}$
 $3^5 a^6 b^5 c^{11}$
 $3abc^2 \sqrt[5]{ac}$

Write in exponent form:

5. $2\sqrt[4]{3x^2}$
 $2(3x^2)^{1/4}$

6. $\sqrt[5]{(2w)^{-3}}$
 $(2w)^{-3/5}$
 \downarrow
 $\frac{1}{(2w)^{3/5}}$

7. $-18\sqrt[3]{3(xy)^2}$
 $-18(3x^2y^2)^{1/3}$

8. $9\sqrt{(5z)^3}$
 $9(5z)^{3/2}$
 $9 \cdot 5z (5z)^{1/2}$
 $45z(5z)^{1/2}$

Write in radical form:

9. $(3w)^{1/2}$
 $\sqrt{3w}$

10. $3(5z)^{1/4}$
 $3\sqrt[4]{5z}$

11. $4x^{1/3}$
 $4\sqrt[3]{x}$

12. $3(6y)^{1/2}$
 $3\sqrt{6y}$

Determine if the simplification is -i, i, -1, or 1.

$i \quad i^2 = -1 \quad i^3 = -i \quad i^4 = 1$

13. i^{20}
 1

14. i^{19}
 $-i$

15. i^{21}
 i

16. i^9
 i

Describe the number and type of solutions, and sketch an example graph based on the given DISCRIMINANT.

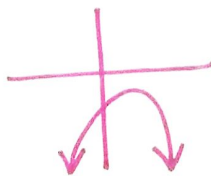
17. $b^2 - 4ac = 7$

2 real solutions



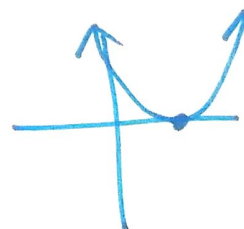
18. $b^2 - 4ac = -10$

2 imaginary solutions



19. $b^2 - 4ac = 0$

1 real solution



Simplify the following:

20. $\sqrt{8} + 3 - (\sqrt{2} + 1)$
 $2 + \sqrt{2}$

21. $10 + \sqrt{3} - \sqrt{27}$
 $10 - 2\sqrt{3}$

22. $(5 + \sqrt{3})(\sqrt{2} - 1)$
 $-5 - \sqrt{3} + \sqrt{6} + 5\sqrt{2}$

Simplify the following:

23. $(i - 5)^2$
 $24 - 10i$

24. $i^2 - 3i(i + 1) - 4i$
 $2 - 7i$

25. $(-3 - i)(1 + i)$
 $-2 - 4i$

List the most specific category (Natural, Whole, Real, Integer...etc.) for the following:

26. 0

whole

27. -0.5

rational

27. 2

natural

28. $\sqrt{2}$

irrational

List all of the categories (Natural, Whole, Real, Integer...etc.) for the following:

29. 1
natural, whole,
integer, rational,
real

30. $-\frac{1}{3}$
rational,
real

31. $3i$
imaginary

32. $\sqrt{2}$
irrational,
real

Simplify completely. Do not leave negative exponents in your answer.

33. $3x^2(4x^2y^3)^2(2xy^4z)$
 $3x^2(16x^4y^6)(2xy^4z)$
 $96x^7y^{10}z$

34. $(8x^2y^4z^3)(4xy^{-3}z^{-2})^3$
 $(8x^2y^4z^3)(64x^3y^{-9}z^{-6})$
 $512x^5y^{-5}z^{-3}$
 $\frac{512x^5}{y^5z^3}$

35. $\frac{2a^{-4}b^{-5}}{8a^{-4}b^{-5}c^{-8}}$

$\frac{1}{4c^{-8}} \rightarrow \frac{c^8}{4}$

36. $\frac{4((5w^2x^5z^{-2})^0)^2}{5((2xy)^0(m^2n)^5)^0}$

$\frac{4(1)^2}{5(1)} = \frac{4}{5}$

$$\begin{aligned} \textcircled{20} \quad & \sqrt{8} + 3 - (\sqrt{2} + 1) \\ & 2\sqrt{2} + 3 - \sqrt{2} - 1 \\ & \boxed{2 + \sqrt{2}} \end{aligned}$$

$$\begin{aligned} \textcircled{21} \quad & 10 + \sqrt{3} - \sqrt{27} \\ & 10 + \sqrt{3} - 3\sqrt{3} \\ & \boxed{10 - 2\sqrt{3}} \end{aligned}$$

$$\begin{aligned} \textcircled{22} \quad & (5 + \sqrt{3})(\sqrt{2} - 1) \\ & 5\sqrt{2} - 5 + \sqrt{6} - \sqrt{3} \\ & \boxed{-5 - \sqrt{3} + \sqrt{6} + 5\sqrt{2}} \end{aligned}$$

$$\begin{aligned} \textcircled{23} \quad & (i-5)^2 \\ & (i-5)(i-5) \\ & i^2 - 5i - 5i + 25 \\ & -1 - 10i + 25 \\ & \boxed{24 - 10i} \end{aligned}$$

$$\begin{aligned} \textcircled{24} \quad & i^2 - 3i(i+1) - 4i \\ & -1 - 3i^2 - 3i - 4i \\ & -1 - 3(-1) - 7i \\ & -1 + 3 - 7i \\ & \boxed{2 - 7i} \end{aligned}$$

$$\begin{aligned} \textcircled{25} \quad & (-3-i)(1+i) \\ & -3 - 3i - i - i^2 \\ & -3 - 4i + 1 \\ & \boxed{-2 - 4i} \end{aligned}$$

Solve by either factoring, quadratic formula, or completing the square.

37. $2x^2 - 9x = 5$

$$2x^2 - 9x - 5 = 0$$

$$x = \frac{9 \pm \sqrt{(-9)^2 - 4(2)(-5)}}{2(2)}$$

$$x = \frac{9 \pm \sqrt{121}}{4} = \frac{9 \pm 11}{4}$$

$$\frac{9+11}{4} = \frac{20}{4} = \boxed{5}$$

$$\frac{9-11}{4} = \frac{-2}{4} = \boxed{-\frac{1}{2}}$$

37. $2x^2 + 4x + 3 = 0$

$$2(x^2 + 2x + \boxed{1}) + 3 + \boxed{-2} = 0$$

$$2(x+1)^2 + 1 = 0$$

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

$$(x+1)^2 = -\frac{1}{2}$$

$$x+1 = \pm \sqrt{-\frac{1}{2}}$$

$$x = -1 \pm \sqrt{-\frac{1}{2}}$$

$$x = \boxed{-1 \pm i\sqrt{\frac{1}{2}}}$$

38. $x^2 - 5x + 2 = 0$

$$x = \frac{5 \pm \sqrt{(-5)^2 - 4(1)(2)}}{2(1)}$$

$$x = \boxed{\frac{5 \pm \sqrt{17}}{2}}$$

*does not simplify

38. $x^2 - 7x + 10 = 0$

$$(x-5)(x-2) = 0$$

$$x-5=0 \quad x-2=0$$

$$x = \boxed{5} \quad x = \boxed{2}$$

39. $3x^2 - 6x + 2 = -1$

$$3x^2 - 6x + 3 = 0$$

$$3(x^2 - 2x + 1) = 0$$

$$3(x-1)(x-1) = 0$$

$$3(x-1)^2 = 0$$

$$(x-1)^2 = 0$$

$$x-1 = 0$$

$$x = \boxed{1}$$

*only one

solution
(vertex = x-intercept)

39. $3x^2 - 3x - 18 = 0$

$$x = \frac{3 \pm \sqrt{(-3)^2 - 4(3)(-18)}}{2(3)}$$

$$x = \frac{3 \pm \sqrt{225}}{6}$$

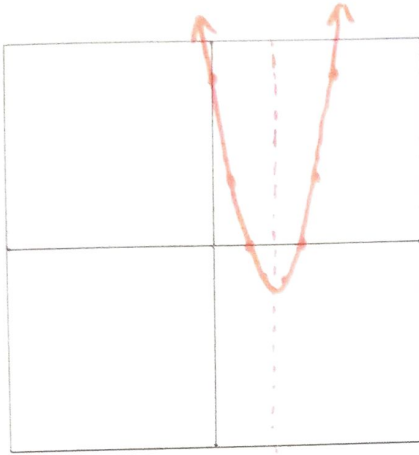
$$x = \frac{3 \pm 15}{6}$$

$$\frac{3+15}{6} = \frac{18}{6} = \boxed{3}$$

$$\frac{3-15}{6} = \frac{-12}{6} = \boxed{-2}$$

Sketch a graph of solutions for:

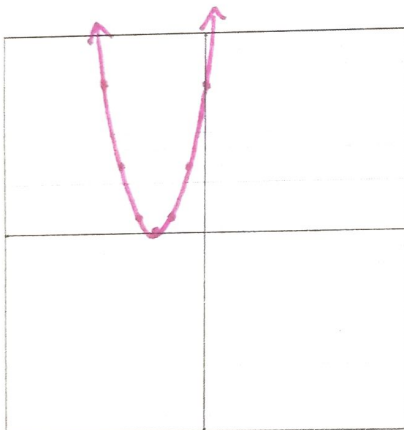
40. $(x - 2)(x - 5) = 0$



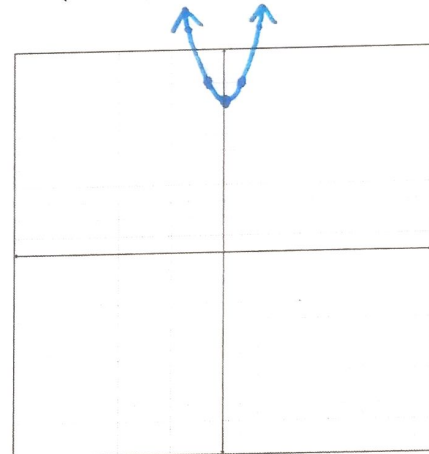
41. $(x - \sqrt{5})(x + \sqrt{5}) = 0$



42. $(x + 3)^2 = 0$



43. $(x - 3i)(x + 3i) = 0$



$$\begin{aligned} x^2 + 3ix - 3ix - 9i^2 \\ x^2 - 9(-1) \\ x^2 + 9 \end{aligned}$$