**Chapter 1**
**Section 1.6**

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### Equations Involving Square Roots

In general, it is easier to work with an equation not containing square roots. This is why we use the formula $a^2 + b^2 = c^2$ instead of $\sqrt{a^2 + b^2} = c$. Therefore, in most instances, we will try squaring both sides of an equation involving square roots. **Hint:** It is usually easier to isolate the square root first.

(1) By isolating the square root and squaring both sides, solve $\sqrt{x} + 12 = x$.

$x = 9$ or $16$

(2) Solve $w = \frac{\sqrt{1-3w}}{2}$.

$w = -1$ or $\frac{1}{4}$

(3) By squaring each side twice, solve $\sqrt{n+4} + \sqrt{n-1} = 5$.

$n = 5$

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### Equations of Quadratic Type

**Def:** An **equation of quadratic type** is an equation of the form $au^2 + bu + c = 0$ where $u$ is an algebraic expression.

**Q:** Is a quadratic equation an example of an equation of quadratic type? Yes

### Exercises

(1) Solve the following equation of quadratic type $x^4 - 14x^2 + 45 = 0$.

$x = \pm 3$ or $\pm\sqrt{5}$

(2) Solve the equation $(x^2 + x)^2 - 8(x^2 + x) + 12 = 0$.

$x = 1, \pm 2, -3$

(3) Solve this equation of quadratic type $x^{2/3} - 9x^{1/3} + 8 = 0$.

$x = 1, 512$

**Equations with Rational Exponents**

Solving an equation with rational exponents involves a similar method to solving an equation with square roots (since a square root is an exponent of 1/2 which is definitely rational). You first want to isolate your term with rational exponent and then raise both sides to the reciprocal of the rational exponent. **Hint:** Remember our exponent rules, $x^{a/b} = (x^{1/b})^a = (x^a)^{1/b}$.

(1) Solve the equation $x^{4/3} = 625$.

$x = 125$

(2) Solve the equation $(y-2)^{-5/2} = 32$.

$y = \frac{9}{4}$

(3) If you had troubles with (3) of the previous section, now is the time to go back and finish it.

**Q:** When dealing with rational equations $x^{a/b} = c$ with $a, b, c \in \mathbf{R}$ and $b \neq 0$ when will your answer require a $\pm$ symbol? When a (the numerator) is even. B/c then $(x)^a = (-x)^a$.

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**Equations Involving Absolute Value**

We have already discussed methods for solving simple absolute value equations. When you have an equation of the form $|u| = |v|$ where $u$ and $v$ are algebraic expressions you just need to remember that this is equivalent to saying $u$ and $v$ are either equal or opposite.

(1) Solve the equation $|x^2 - 6| = 5x$.

$x = \pm 1, \pm 6$

(2) Solve the equation $|x^2 - 2x| = |3x - 6|$.

$x = 2, \pm 3$

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