**Chapter 1: Equations and Inequalities**

1.6 🡪 Other Types of Equations

In this section, we will extend the techniques we learned to solve linear and quadratic equations and apply them to solve polynomial equations.

At this point, you’ve learned four basic methods for solving nonlinear equations:

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So the main goal of this section is to learn how to *rewrite* nonlinear equation in a form to which you can apply one of the methods listed above.

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POLYNOMIAL EQUATIONS

**Solving a Polynomial Equation by Factoring**

1. $3x^{4}=48x^{2}$ 2. $x^{3}-3x^{2}-3x+9=0$ 3. $x^{4}-3x^{2}+2=0$

4. $4x^{4}- 36x^{2}=0$ 5. $x^{4}-x^{3}+x-1=0$ 6. $x^{6}+7x^{3}-8=0$

EQUATIONS INVOLVING RADICALS

The steps involved solving radical equations will *often* introduce **extraneous solutions**.

Operations such as:

squaring both sides of an equation

raising both sides of an equation to a rational power

multiplying both sides by a variable

all have this potential of producing extraneous solutions. Therefore, when you use these operations a **CHECK** is crucial.

**Solving an Equation Involving a Radical**

7. $\sqrt{5-x}-3=0$ Check:

8. $\sqrt{2x+7}-x=2$ Check:

9. $\sqrt[3]{2x+5}+3=0$ Check:

**Solving an Equation Involving a Rational Exponent**

10. $\left(n-27\right)^{\frac{3}{2} }=64$ Check:

11. $\left(x^{2}-x-22\right)^{\frac{4}{3}}=16$ Check:

12. $5=3+4a^{-\frac{1}{6}}$ Check:

EQUATIONS WITH FRACTIONS (a little review)

Check:

13. $\frac{2}{x}=\frac{3}{x-2}-1$

Check:

14. $\frac{x}{x^{2}-4}+\frac{1}{x+2}=3$

 Check:

15. $\frac{x+1}{3}-\frac{x+1}{x+2}=0$

EQUATIONS WITH ABSOLUTE VALUES

To solve an equation involving an absolute value, remember that the expression inside the absolute value signs can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This will results in *two* separate equations, each of which must be solved. Therefore, it is possible to have *two* solutions.

$$\left|x\right|=5$$

The absolute value of what number will give you a result of 5? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

16. $\left|x-2\right|=3$ Check:

17. $\left|3x+2\right|= 7$ Check:

18. $\left|x^{2}-3x\right|= -4x+6$ Check:

APPLICATIONS

19. A ski club chartered a bus for a ski trip at a cost of $480. In an attempt to lower the bus

 fare per skier, the club invited non-members to go along. After five non-members joined

 the trip, the fare per skier decreased by $4.80. How many club members are going on the

 trip?

20. Suppose that when you were born your grandparents deposited $5000 in a long-term

 investment in which the interest was compounded quarterly. On your 25th birthday the

 value of the investment is $25,062.59. What was the annual interest rate for this

 investment?

21. The marketing department at a publishing firm is asked to determine the price of a book.

 The department determines that the demand for the book depends on the price of the

 book according to the formula:



Where p is the price per book in dollars and x is the number of books sold at the given price. If the publisher set the price at $12.95, how many copies would be sold?

22. In example 21, suppose that the cost of producing the book in $150,000 plus $5.50 per

 book. Then the cost equation is:

C = 5.5x + 150,000

Where C is measured in dollars and x represents the number of books produced.. From example 3, the total revenue is given by

 

Use the equations above to find an equation that represents the profit for the company, then find the profit when 5 million books are sold.