

Summer Work – Precalculus CP – Mr. Killheffer

Hello Everyone,

I am excited to have you in class this coming school year! I love math and working with students to help them understand and enjoy working with math.

This is the summer work for Precalculus CP. They are practice problems for concepts that I hope you recall from Algebra I and II. These are concepts you need for Precalculus.

My expectation for the year is that if you do not know how to do a problem, you do your best to find out how to do it. During class that means always asking a question if you do not know how to do a problem or if you do not understand something I said. You have several resources available to you online including khanacademy.org and google.com. If you get stuck, check out an online source.

When school starts, I will spend the first two to four classes answering any questions you have on the summer work. On the next day of class I will give a test on the summer work that covers the same types of problems to see where you stand.

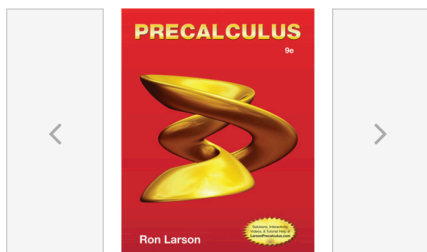
Good luck and I look forward to working with you!

Mr. Killheffer

NOTE: The answers to the odd-numbered problems and partial worked out solutions can be found on calcchat.com for the Precalculus, 9th edition. Now and during the year, I assign odd-numbered problem because the answers are in the back of the book. I do this so you can see if you are getting the problems right so you can make sure you are doing the problems correctly. Your number one job is to understand the material. I frequently say in class, **“Your goal is not to get it done.... It’s to get it.”** Needless to say, copying answers is not getting it. When I look at your work, I will always give you honest feedback on how well you **get it.**

This is what it looks like on the calcchat.com opening page when you scroll down and select Precalculus, 9e

Precalculus & College Algebra



Precalculus with Limits 4e, High School
College Algebra Real Math Real People 7e
Algebra and Trigonometry Real Mathematics Real People
Precalculus 9e
Algebra and Trigonometry 9e
College Algebra 9e
Precalculus with Limits 2e

A.2 Exercises

See CalcChat.com for tutorial help and worked-out solutions to odd-numbered exercises.

Vocabulary: Fill in the blanks.

- In the exponential form a^n , n is the _____ and a is the _____.
- A convenient way of writing very large or very small numbers is called _____.
- One of the two equal factors of a number is called a _____ of the number.
- In the radical form $\sqrt[n]{a}$, the positive integer n is the _____ of the radical and the number a is the _____.
- Radical expressions can be combined (added or subtracted) when they are _____.
- The expressions $a + b\sqrt{m}$ and $a - b\sqrt{m}$ are _____ of each other.
- The process used to create a radical-free denominator is known as _____ the denominator.
- In the expression $b^{m/n}$, m denotes the _____ to which the base is raised and n denotes the _____ or root to be taken.

Skills and Applications

Evaluating Exponential Expressions In Exercises 9–14, evaluate each expression.

- (a) $3 \cdot 3^3$ (b) $\frac{3^2}{3^4}$
- (a) $(3^3)^0$ (b) -3^2
- (a) $(2^3 \cdot 3^2)^2$ (b) $(-\frac{2}{5})^3(\frac{5}{3})^2$
- (a) $\frac{3}{3^{-4}}$ (b) $48(-4)^{-3}$
- (a) $\frac{4 \cdot 3^{-2}}{2^{-2} \cdot 3^{-1}}$ (b) $(-2)^0$
- (a) $3^{-1} + 2^{-2}$ (b) $(3^{-2})^2$

Evaluating an Algebraic Expression In Exercises 15–20, evaluate the expression for the given value of x .

- $-3x^3$, $x = 2$ (b) $7x^{-2}$, $x = 4$
- $6x^0$, $x = 10$ (b) $2x^3$, $x = -3$
- $-3x^4$, $x = -2$ (b) $12(-x)^3$, $x = -\frac{1}{3}$

Using Properties of Exponents In Exercises 21–26, simplify each expression.

- (a) $(-5z)^3$ (b) $5x^4(x^2)$
- (a) $(3x)^2$ (b) $(4x^3)^0$, $x \neq 0$
- (a) $6y^2(2y^0)^2$ (b) $(-z)^3(3z^4)$
- (a) $\frac{7x^2}{x^3}$ (b) $\frac{12(x+y)^3}{9(x+y)}$
- (a) $(\frac{4}{y})^3(\frac{3}{y})^4$ (b) $(\frac{b^{-2}}{a^{-2}})(\frac{b}{a})^2$
- (a) $[(x^2y^{-2})^{-1}]^{-1}$ (b) $(5x^2z^6)^3(5x^2z^6)^{-3}$

Rewriting with Positive Exponents In Exercises 27–30, rewrite each expression with positive exponents and simplify.

- (a) $(x+5)^0$, $x \neq -5$ (b) $(2x^2)^{-2}$

- (a) $(4y^{-2})(8y^4)$ (b) $(z+2)^{-3}(z+2)^{-1}$
- (a) $(\frac{x^{-3}y^4}{5})^{-3}$ (b) $(\frac{a^{-2}}{b^{-2}})(\frac{b}{a})^3$
- (a) $3^n \cdot 3^{2n}$ (b) $\frac{x^2 \cdot x^n}{x^3 \cdot x^m}$

Scientific Notation In Exercises 31–34, write the number in scientific notation.

- 10,250.4 (b) -0.000125
- One micron (millionth of a meter): 0.00003937 inch
- Land area of Earth: 57,300,000 square miles

Decimal Notation In Exercises 35–38, write the number in decimal notation.

- 3.14×10^{-4} (b) -1.801×10^5
- Light year: 9.46×10^{12} kilometers
- Width of a human hair: 9.0×10^{-5} meter

Using Scientific Notation In Exercises 39 and 40, evaluate each expression without using a calculator.

- (a) $(2.0 \times 10^9)(3.4 \times 10^{-4})$
(b) $(1.2 \times 10^7)(5.0 \times 10^{-3})$
- (a) $\frac{6.0 \times 10^8}{3.0 \times 10^{-3}}$ (b) $\frac{2.5 \times 10^{-3}}{5.0 \times 10^2}$

Evaluating Expressions Involving Radicals In Exercises 41 and 42, evaluate each expression without using a calculator.

- (a) $\sqrt{9}$ (b) $\sqrt[3]{\frac{27}{8}}$ (c) $\sqrt[2]{27}$ (d) $(\sqrt{36})^3$

Using Properties of Radicals In Exercises 43 and 44, use the properties of radicals to simplify each expression.

- (a) $(\sqrt[3]{2})^5$ (b) $\sqrt[5]{32x^5}$
- (a) $\sqrt{12} \cdot \sqrt{3}$ (b) $\sqrt[4]{(3x^2)^4}$

A.3 ExercisesSee CalcChat.com for tutorial help and worked-out solutions to odd-numbered exercises.**Vocabulary:** Fill in the blanks.

- For the polynomial $a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0$, $a_n \neq 0$, the degree is _____, the leading coefficient is _____, and the constant term is _____.
- A polynomial with one term is called a _____, while a polynomial with two terms is called a _____ and a polynomial with three terms is called a _____.
- To add or subtract polynomials, add or subtract the _____ by adding their coefficients.
- The letters in "FOIL" stand for the following. F _____ O _____ I _____ L _____
- The process of writing a polynomial as a product is called _____.
- A polynomial is _____ when each of its factors is prime.
- A _____ is the square of a binomial, and it has the form $u^2 + 2uv + v^2$ or $u^2 - 2uv + v^2$.
- When a polynomial has more than three terms, a method of factoring called _____ may be used.

Skills and Applications

Polynomials In Exercises 9–18, (a) write the polynomial in standard form, (b) identify the degree and leading coefficient of the polynomial, and (c) state whether the polynomial is a monomial, a binomial, or a trinomial.

- | | |
|---------------------------|------------------------------|
| 9. $14x - \frac{1}{2}x^5$ | 10. $7x$ |
| 11. $3 - x^6$ | 12. $-y + 25y^2 + 1$ |
| 13. 3 | 14. $-8 + t^2$ |
| 15. $1 + 6x^4 - 4x^5$ | 16. $3 + 2x$ |
| 17. $4x^3y$ | 18. $-x^5y + 2x^2y^2 + xy^4$ |

Operations with Polynomials In Exercises 19–26, perform the operation and write the result in standard form.

- $(6x + 5) - (8x + 15)$
- $(2x^2 + 1) - (x^2 - 2x + 1)$
- $(15x^2 - 6) - (-8.3x^3 - 14.7x^2 - 17)$
- $(15.6w^4 - 14w - 17.4) - (16.9w^4 - 9.2w + 13)$
- $3x(x^2 - 2x + 1)$
- $y^2(4y^2 + 2y - 3)$
- $-5z(3z - 1)$
- $(-3x)(5x + 2)$

Multiplying Polynomials In Exercises 27–40, multiply or find the special product.

- | | |
|------------------------------------|--------------------------|
| 27. $(x + 3)(x + 4)$ | 28. $(x - 5)(x + 10)$ |
| 29. $(x^2 - x + 1)(x^2 + x + 1)$ | |
| 30. $(2x^2 - x + 4)(x^2 + 3x + 2)$ | |
| 31. $(x + 10)(x - 10)$ | 32. $(4a + 5b)(4a - 5b)$ |
| 33. $(2x + 3)^2$ | 34. $(8x + 3)^2$ |
| 35. $(x + 1)^3$ | 36. $(3x + 2y)^3$ |

- $[(m - 3) + n][(m - 3) - n]$
- $[(x - 3y) + z][(x - 3y) - z]$
- $[(x - 3) + y]^2$
- $[(x + 1) - y]^2$

Factoring Out a Common Factor In Exercises 41–44, factor out the common factor.

- | | |
|----------------------------|----------------------------|
| 41. $2x^3 - 6x$ | 42. $3z^3 - 6z^2 + 9z$ |
| 43. $3x(x - 5) + 8(x - 5)$ | 44. $(x + 3)^2 - 4(x + 3)$ |

Greatest Common Factor In Exercises 45–48, find the greatest common factor such that the remaining factors have only integer coefficients.

- | | |
|--------------------------------------|--------------------------------------|
| 45. $\frac{1}{2}x^3 + 2x^2 - 5x$ | 46. $\frac{1}{3}y^4 - 5y^2 + 2y$ |
| 47. $\frac{2}{3}x(x - 3) - 4(x - 3)$ | 48. $\frac{4}{3}y(y + 1) - 2(y + 1)$ |

Factoring the Difference of Two Squares In Exercises 49–52, completely factor the difference of two squares.

- | | |
|---------------------|----------------------|
| 49. $x^2 - 81$ | 50. $x^2 - 64$ |
| 51. $(x - 1)^2 - 4$ | 52. $25 - (z + 5)^2$ |

Factoring a Perfect Square Trinomial In Exercises 53–58, factor the perfect square trinomial.

- | | |
|-----------------------------|--|
| 53. $x^2 - 4x + 4$ | 54. $4t^2 + 4t + 1$ |
| 55. $9u^2 + 24uv + 16v^2$ | 56. $36y^2 - 108y + 81$ |
| 57. $z^2 + z + \frac{1}{4}$ | 58. $9y^2 - \frac{3}{2}y + \frac{1}{16}$ |

Factoring the Sum or Difference of Cubes In Exercises 59–62, factor the sum or difference of cubes.

- | | |
|-----------------|-------------------|
| 59. $x^3 - 8$ | 60. $27 - x^3$ |
| 61. $27x^3 + 8$ | 62. $u^3 + 27v^3$ |

A.4 Exercises

See CalcChat.com for tutorial help and worked-out solutions to odd-numbered exercises.

Vocabulary: Fill in the blanks.

- The set of real numbers for which an algebraic expression is defined is the _____ of the expression.
- The quotient of two algebraic expressions is a fractional expression, and the quotient of two polynomials is a _____.
- Fractional expressions with separate fractions in the numerator, denominator, or both are called _____ fractions.
- Two algebraic expressions that have the same domain and yield the same values for all numbers in their domains are called _____.

Skills and Applications

Finding the Domain of an Algebraic Expression In Exercises 5–16, find the domain of the expression.

- | | |
|---------------------------------|----------------------------------|
| 5. $3x^2 - 4x + 7$ | 6. $6x^2 - 9, \quad x > 0$ |
| 7. $\frac{1}{3-x}$ | 8. $\frac{x+6}{3x+2}$ |
| 9. $\frac{x^2-1}{x^2-2x+1}$ | 10. $\frac{x^2-5x+6}{x^2-4}$ |
| 11. $\frac{x^2-2x-3}{x^2-6x+9}$ | 12. $\frac{x^2-x-12}{x^2-8x+16}$ |
| 13. $\sqrt{4-x}$ | 14. $\sqrt{2x-5}$ |
| 15. $\frac{1}{\sqrt{x-3}}$ | 16. $\frac{1}{\sqrt{x+2}}$ |

Simplifying a Rational Expression In Exercises 17–30, write the rational expression in simplest form.

- | | |
|----------------------------------|------------------------------------|
| 17. $\frac{15x^2}{10x}$ | 18. $\frac{18y^2}{60y^5}$ |
| 19. $\frac{3xy}{xy+x}$ | 20. $\frac{4y-8y^2}{10y-5}$ |
| 21. $\frac{x-5}{10-2x}$ | 22. $\frac{12-4x}{x-3}$ |
| 23. $\frac{y^2-16}{y+4}$ | 24. $\frac{x^2-25}{5-x}$ |
| 25. $\frac{x^3+5x^2+6x}{x^2-4}$ | 26. $\frac{x^2+8x-20}{x^2+11x+10}$ |
| 27. $\frac{2-x+2x^2-x^3}{x^2-4}$ | 28. $\frac{x^2-9}{x^3+x^2-9x-9}$ |
| 29. $\frac{z^3-8}{z^2+2z+4}$ | 30. $\frac{y^3-2y^2-3y}{y^3+1}$ |

31. Error Analysis Describe the error.

$$\frac{5x^3}{2x^3+4} = \frac{5x^3}{2x^3+4} = \frac{5}{2+4} = \frac{5}{6}$$

32. Evaluating a Rational Expression Complete the table. What can you conclude?

x	0	1	2	3	4	5	6
$\frac{x-3}{x^2-x-6}$							
$\frac{1}{x+2}$							

Multiplying or Dividing Rational Expressions In Exercises 33–38, perform the multiplication or division and simplify.

- | | |
|---|--|
| 33. $\frac{5}{x-1} \cdot \frac{x-1}{25(x-2)}$ | 34. $\frac{r}{r-1} \div \frac{r^2}{r^2-1}$ |
| 35. $\frac{4y-16}{5y+15} \div \frac{4-y}{2y+6}$ | 36. $\frac{t^2-t-6}{t^2+6t+9} \cdot \frac{t+3}{t^2-4}$ |
| 37. $\frac{x^2+xy-2y^2}{x^3+x^2y} \cdot \frac{x}{x^2+3xy+2y^2}$ | |
| 38. $\frac{x^2-14x+49}{x^2-49} \div \frac{3x-21}{x+7}$ | |

Adding or Subtracting Rational Expressions In Exercises 39–46, perform the addition or subtraction and simplify.

- | | |
|--|--|
| 39. $6 - \frac{5}{x+3}$ | 40. $\frac{2x-1}{x+3} + \frac{1-x}{x+3}$ |
| 41. $\frac{3}{x-2} + \frac{5}{2-x}$ | 42. $\frac{2x}{x-5} - \frac{5}{5-x}$ |
| 43. $\frac{4}{2x+1} - \frac{x}{x+2}$ | |
| 44. $\frac{1}{x^2-x-2} - \frac{x}{x^2-5x+6}$ | |
| 45. $-\frac{1}{x} + \frac{2}{x^2+1} + \frac{1}{x^3+x}$ | |
| 46. $\frac{2}{x+1} + \frac{2}{x-1} + \frac{1}{x^2-1}$ | |

A.5 Exercises

See CalcChat.com for tutorial help and worked-out solutions to odd-numbered exercises.

Vocabulary: Fill in the blanks.

- An _____ is a statement that equates two algebraic expressions.
- A linear equation in one variable x is an equation that can be written in the standard form _____.
- An _____ solution is a solution that does not satisfy the original equation.
- Four methods that can be used to solve a quadratic equation are _____, extracting _____, _____ the _____, and the _____.

Skills and Applications

Solving a Linear Equation In Exercises 5–12, solve the equation and check your solution. (If not possible, explain why.)

- $x + 11 = 15$
- $7 - x = 19$
- $7 - 2x = 25$
- $3x - 5 = 2x + 7$
- $4y + 2 - 5y = 7 - 6y$
- $0.25x + 0.75(10 - x) = 3$
- $x - 3(2x + 3) = 8 - 5x$
- $9x - 10 = 5x + 2(2x - 5)$

Solving a Rational Equation In Exercises 13–24, solve the equation and check your solution. (If not possible, explain why.)

- $\frac{3x}{8} - \frac{4x}{3} = 4$
- $\frac{5x}{4} + \frac{1}{2} = x - \frac{1}{2}$
- $\frac{5x - 4}{5x + 4} = \frac{2}{3}$
- $\frac{10x + 3}{5x + 6} = \frac{1}{2}$
- $10 - \frac{13}{x} = 4 + \frac{5}{x}$
- $\frac{1}{x} + \frac{2}{x - 5} = 0$
- $\frac{x}{x + 4} + \frac{4}{x + 4} + 2 = 0$
- $\frac{7}{2x + 1} - \frac{8x}{2x - 1} = -4$
- $\frac{2}{(x - 4)(x - 2)} = \frac{1}{x - 4} + \frac{2}{x - 2}$
- $\frac{4}{x - 1} + \frac{6}{3x + 1} = \frac{15}{3x + 1}$
- $\frac{1}{x - 3} + \frac{1}{x + 3} = \frac{10}{x^2 - 9}$
- $\frac{1}{x - 2} + \frac{3}{x + 3} = \frac{4}{x^2 + x - 6}$

Solving a Quadratic Equation by Factoring In Exercises 25–34, solve the quadratic equation by factoring.

- $6x^2 + 3x = 0$
- $9x^2 - 1 = 0$
- $x^2 - 2x - 8 = 0$
- $x^2 - 10x + 9 = 0$
- $x^2 + 10x + 25 = 0$
- $4x^2 + 12x + 9 = 0$
- $x^2 + 4x = 12$
- $-x^2 + 8x = 12$
- $\frac{3}{4}x^2 + 8x + 20 = 0$
- $\frac{1}{8}x^2 - x - 16 = 0$

Extracting Square Roots In Exercises 35–42, solve the equation by extracting square roots. When a solution is irrational, list both the exact solution and its approximation rounded to two decimal places.

- $x^2 = 49$
- $x^2 = 32$
- $3x^2 = 81$
- $9x^2 = 36$
- $(x - 12)^2 = 16$
- $(x + 9)^2 = 24$
- $(2x - 1)^2 = 18$
- $(x - 7)^2 = (x + 3)^2$

Completing the Square In Exercises 43–50, solve the quadratic equation by completing the square.

- $x^2 + 4x - 32 = 0$
- $x^2 - 2x - 3 = 0$
- $x^2 + 6x + 2 = 0$
- $x^2 + 8x + 14 = 0$
- $9x^2 - 18x = -3$
- $7 + 2x - x^2 = 0$
- $2x^2 + 5x - 8 = 0$
- $3x^2 - 4x - 7 = 0$

Using the Quadratic Formula In Exercises 51–64, use the Quadratic Formula to solve the equation.

- $2x^2 + x - 1 = 0$
- $2x^2 - x - 1 = 0$
- $2 + 2x - x^2 = 0$
- $x^2 - 10x + 22 = 0$
- $2x^2 - 3x - 4 = 0$
- $3x + x^2 - 1 = 0$
- $12x - 9x^2 = -3$
- $9x^2 - 37 = 6x$
- $9x^2 + 30x + 25 = 0$
- $28x - 49x^2 = 4$
- $8t = 5 + 2t^2$
- $25h^2 + 80h + 61 = 0$
- $(y - 5)^2 = 2y$
- $(z + 6)^2 = -2z$