Summer Work – Precalculus Honors – 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 Honors. 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, as honors students, if you do not know how to do a problem, you do your best to find out how to do it. You have several resources available to you online including khanacademy.org and google.com. If you get stuck, check out an online source.

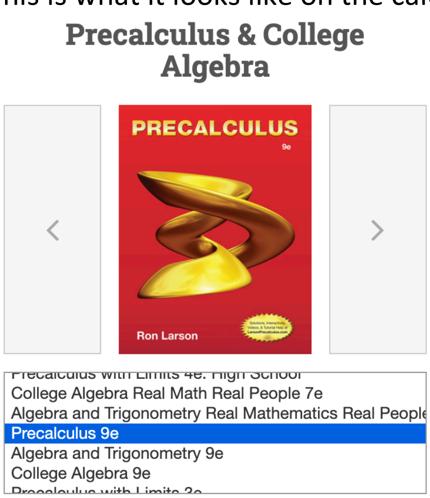
When school starts, I will spend the first two classes answering any questions you have on the summer work. On the third day of class I will give a test on the summer work that covers the same types of problems to see where you stand.

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. If 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



Do 9-29 odd on this page

A.2 Exercises

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

Vocabulary: Fill in the blanks.

1. In the exponential form a^n, n is the ________ and a is the ________.
2. A convenient way of writing very large or very small numbers is called ________ ________.
3. One of the two equal factors of a number is called a ________ ________ of the number.
4. In the radical form $\sqrt[n]{a}$, the positive integer n is the ________ of the radical and the number a is the ________.
5. Radical expressions can be combined (added or subtracted) when they are ________ ________.
6. The expressions $a + b\sqrt{m}$ and $a - b\sqrt{m}$ are ________ of each other.
7. The process used to create a radical-free denominator is known as ________ the denominator.
8. 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.**

9. (a) $3 \cdot 3^3$ (b) $\dfrac{3^2}{3^4}$
10. (a) $(3^3)^0$ (b) -3^2
11. (a) $(2^3 \cdot 3^2)^2$ (b) $\left(-\frac{3}{5}\right)^3\left(\frac{5}{3}\right)^2$
12. (a) $\dfrac{3}{3^{-4}}$ (b) $48(-4)^{-3}$
13. (a) $\dfrac{4 \cdot 3^{-2}}{2^{-2} \cdot 3^{-1}}$ (b) $(-2)^0$
14. (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.**

15. $-3x^3$, $x = 2$
16. $7x^{-2}$, $x = 4$
17. $6x^0$, $x = 10$
18. $2x^3$, $x = -3$
19. $-3x^4$, $x = -2$
20. $12(-x)^3$, $x = -\frac{1}{3}$

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

21. (a) $(-5z)^3$ (b) $5x^4(x^2)$
22. (a) $(3x)^2$ (b) $(4x^3)^0$, $x \neq 0$
23. (a) $6y^2(2y^0)^2$ (b) $(-z)^3(3z^4)$
24. (a) $\dfrac{7x^2}{x^3}$ (b) $\dfrac{12(x+y)^3}{9(x+y)}$
25. (a) $\left(\dfrac{4}{y}\right)^3\left(\dfrac{3}{y}\right)^4$ (b) $\left(\dfrac{b^{-2}}{a^{-2}}\right)\left(\dfrac{b}{a}\right)^2$
26. (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.**

27. (a) $(x+5)^0$, $x \neq -5$ (b) $(2x^2)^{-2}$
28. (a) $(4y^{-2})(8y^4)$ (b) $(z+2)^{-3}(z+2)^{-1}$
29. (a) $\left(\dfrac{x^{-3}y^4}{5}\right)^{-3}$ (b) $\left(\dfrac{a^{-2}}{b^{-2}}\right)\left(\dfrac{b}{a}\right)^3$
30. (a) $3^n \cdot 3^{2n}$ (b) $\dfrac{x^2 \cdot x^n}{x^3 \cdot x^n}$

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

31. 10,250.4
32. −0.000125
33. One micron (millionth of a meter): 0.00003937 inch
34. Land area of Earth: 57,300,000 square miles

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

35. 3.14×10^{-4}
36. -1.801×10^5
37. Light year: 9.46×10^{12} kilometers
38. 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.**

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

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

41. (a) $\sqrt{9}$ (b) $\sqrt[3]{\frac{27}{8}}$
42. (a) $\sqrt[3]{27}$ (b) $\left(\sqrt{36}\right)^3$

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

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

Do 9-61 odd

A.3 Exercises

Vocabulary: Fill in the blanks.

1. 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 ________.
2. 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 ________.
3. To add or subtract polynomials, add or subtract the ________ ________ by adding their coefficients.
4. The letters in "FOIL" stand for the following. F ________ O ________ I ________ L ________
5. The process of writing a polynomial as a product is called ________.
6. A polynomial is ________ ________ when each of its factors is prime.
7. A ________ ________ ________ is the square of a binomial, and it has the form $u^2 + 2uv + v^2$ or $u^2 - 2uv + v^2$.
8. 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.**

19. $(6x + 5) - (8x + 15)$
20. $(2x^2 + 1) - (x^2 - 2x + 1)$
21. $(15x^2 - 6) - (-8.3x^3 - 14.7x^2 - 17)$
22. $(15.6w^4 - 14w - 17.4) - (16.9w^4 - 9.2w + 13)$
23. $3x(x^2 - 2x + 1)$
24. $y^2(4y^2 + 2y - 3)$
25. $-5z(3z - 1)$
26. $(-3x)(5x + 2)$

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. $(3x + 2y)^3$
37. $[(m - 3) + n][(m - 3) - n]$
38. $[(x - 3y) + z][(x - 3y) - z]$
39. $[(x - 3) + y]^2$
40. $[(x + 1) - y]^2$

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. $\frac{4}{5}y(y + 1) - 2(y + 1)$

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. $u^3 + 27v^3$

Do 17-45 odd

A.4 Exercises

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

Vocabulary: Fill in the blanks.

1. The set of real numbers for which an algebraic expression is defined is the ________ of the expression.
2. The quotient of two algebraic expressions is a fractional expression, and the quotient of two polynomials is a ________ ________.
3. Fractional expressions with separate fractions in the numerator, denominator, or both are called ________ fractions.
4. 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. $\dfrac{1}{3 - x}$
8. $\dfrac{x + 6}{3x + 2}$
9. $\dfrac{x^2 - 1}{x^2 - 2x + 1}$
10. $\dfrac{x^2 - 5x + 6}{x^2 - 4}$
11. $\dfrac{x^2 - 2x - 3}{x^2 - 6x + 9}$
12. $\dfrac{x^2 - x - 12}{x^2 - 8x + 16}$
13. $\sqrt{4 - x}$
14. $\sqrt{2x - 5}$
15. $\dfrac{1}{\sqrt{x - 3}}$
16. $\dfrac{1}{\sqrt{x + 2}}$

Simplifying a Rational Expression

In Exercises 17–30, write the rational expression in simplest form.

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

31. **Error Analysis** Describe the error.

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

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

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

Multiplying or Dividing Rational Expressions

In Exercises 33–38, perform the multiplication or division and simplify.

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

Adding or Subtracting Rational Expressions

In Exercises 39–46, perform the addition or subtraction and simplify.

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

Do 5-55 odd

A.5 Exercises

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

Vocabulary: **Fill in the blanks.**

1. An ________ is a statement that equates two algebraic expressions.
2. A linear equation in one variable x is an equation that can be written in the standard form ________.
3. An ________ solution is a solution that does not satisfy the original equation.
4. 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.)**

5. $x + 11 = 15$
6. $7 - x = 19$
7. $7 - 2x = 25$
8. $3x - 5 = 2x + 7$
9. $4y + 2 - 5y = 7 - 6y$
10. $0.25x + 0.75(10 - x) = 3$
11. $x - 3(2x + 3) = 8 - 5x$
12. $9x - 10 = 5x + 2(2x - 5)$

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

13. $\frac{3x}{8} - \frac{4x}{3} = 4$
14. $\frac{5x}{4} + \frac{1}{2} = x - \frac{1}{2}$
15. $\frac{5x - 4}{5x + 4} = \frac{2}{3}$
16. $\frac{10x + 3}{5x + 6} = \frac{1}{2}$
17. $10 - \frac{13}{x} = 4 + \frac{5}{x}$
18. $\frac{1}{x} + \frac{2}{x - 5} = 0$
19. $\frac{x}{x + 4} + \frac{4}{x + 4} + 2 = 0$
20. $\frac{7}{2x + 1} - \frac{8x}{2x - 1} = -4$
21. $\frac{2}{(x - 4)(x - 2)} = \frac{1}{x - 4} + \frac{2}{x - 2}$
22. $\frac{4}{x - 1} + \frac{6}{3x + 1} = \frac{15}{3x + 1}$
23. $\frac{1}{x - 3} + \frac{1}{x + 3} = \frac{10}{x^2 - 9}$
24. $\frac{1}{x - 2} + \frac{3}{x + 3} = \frac{4}{x^2 + x - 6}$

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

25. $6x^2 + 3x = 0$
26. $9x^2 - 1 = 0$
27. $x^2 - 2x - 8 = 0$
28. $x^2 - 10x + 9 = 0$
29. $x^2 + 10x + 25 = 0$
30. $4x^2 + 12x + 9 = 0$
31. $x^2 + 4x = 12$
32. $-x^2 + 8x = 12$
33. $\frac{3}{4}x^2 + 8x + 20 = 0$
34. $\frac{1}{8}x^2 - x - 16 = 0$

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.**

35. $x^2 = 49$
36. $x^2 = 32$
37. $3x^2 = 81$
38. $9x^2 = 36$
39. $(x - 12)^2 = 16$
40. $(x + 9)^2 = 24$
41. $(2x - 1)^2 = 18$
42. $(x - 7)^2 = (x + 3)^2$

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

43. $x^2 + 4x - 32 = 0$
44. $x^2 - 2x - 3 = 0$
45. $x^2 + 6x + 2 = 0$
46. $x^2 + 8x + 14 = 0$
47. $9x^2 - 18x = -3$
48. $7 + 2x - x^2 = 0$
49. $2x^2 + 5x - 8 = 0$
50. $3x^2 - 4x - 7 = 0$

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

51. $2x^2 + x - 1 = 0$
52. $2x^2 - x - 1 = 0$
53. $2 + 2x - x^2 = 0$
54. $x^2 - 10x + 22 = 0$
55. $2x^2 - 3x - 4 = 0$
56. $3x + x^2 - 1 = 0$
57. $12x - 9x^2 = -3$
58. $9x^2 - 37 = 6x$
59. $9x^2 + 30x + 25 = 0$
60. $28x - 49x^2 = 4$
61. $8t = 5 + 2t^2$
62. $25h^2 + 80h + 61 = 0$
63. $(y - 5)^2 = 2y$
64. $(z + 6)^2 = -2z$