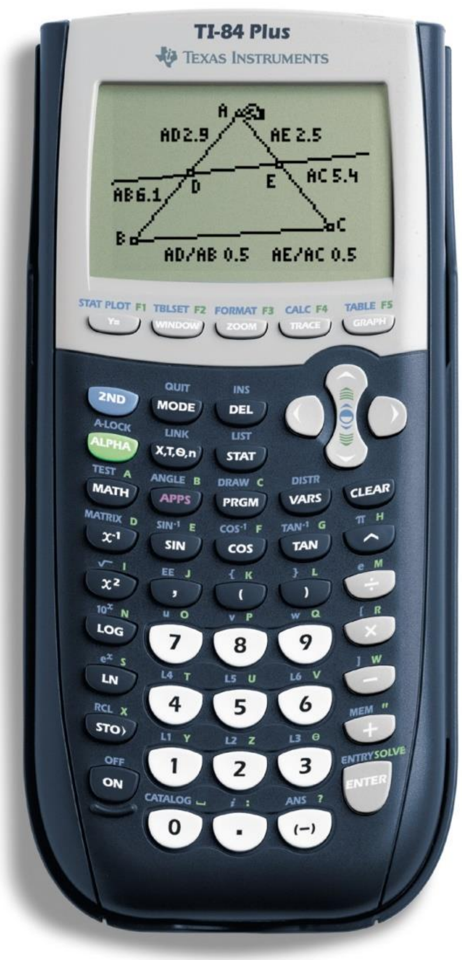
Summer Review for Students Entering PreCalculus with Trig.

1. Finding the Equation of Parallel and Perpendicular Lines
2. Identifying Domain and Range
3. Function Notation
4. Multiplying Polynomials and Solving Quadratics
5. Trig Ratios and the Pythagorean Theorem
6. Multiplying and Dividing Rational Expressions
7. Adding and Subtracting Rational Expressions
8. Laws of Exponents



All PreCalculus students are required to have a TI 84-Plus Graphing Calculator for this course.

The calculator will be used throughout this course, and in future math courses.

Please keep your eyes open for sales and purchase one before school begins.

This packet will be collected the first week of class.

Parallel and Perpendicular Lines

PARALLEL LINES have the same slope.
PERPENDICULAR LINES have opposite and reciprocal slopes. (change the sign and flip the fraction)

<u>WRITING THE EQUATION OF PARALLEL AND PERPENDICULAR LINES</u>. Write the equation of the line described. SHOW ALL WORK.

1. Write the equation of the line parallel to $y = \frac{2}{3}x - 7$, passing through $(6, 5)$.

2. Write the equation of the line parallel to $2x + 5y = 8$, passing through $(10, 18)$.

3. Write the equation of the line perpendicular to $y = \frac{1}{3}x + 5$, passing through $(6, -4)$.

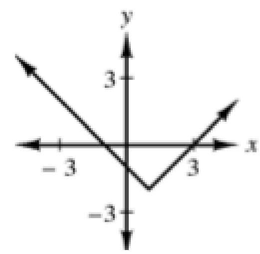
4. Write the equation of the line perpendicular to $2x - 3y = 4$, passing through $(-4, -5)$.

Using Function Notation and Identifying Domain and Range

Domain: the set of possible inputs of a function, the "x" values
Range: the set of possible outputs of a function, the "y" values

<u>EXAMPLE</u>: Find the domain and range of: $f(x) = |x - 1| - 2$

We start by graphing the function, as shown at right. Since we can use any real number for x in this equation, **the domain is all real numbers**. The smallest possible result for y is –2, so **the range is $y \geq -2$.**



<u>IDENTIFYING DOMAIN AND RANGE</u>. Identify the domain and range (when appropriate) of each function. SHOW ALL WORK.

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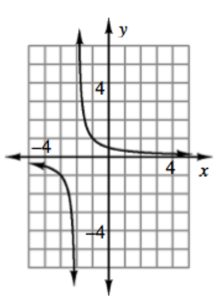

Domain: ________________

Range: ________________

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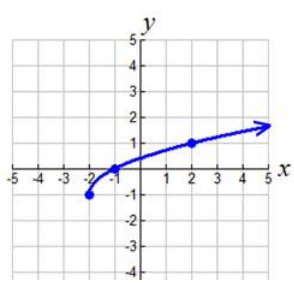

Domain: ________________

Range: ________________

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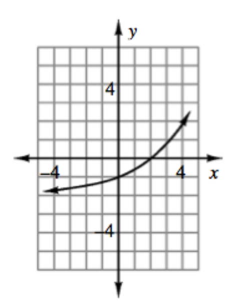


Domain: ________________

Range: ________________

8. $f(x) = \frac{2x+1}{x-5}$

9. $f(x) = \sqrt{x-4}$

10. $f(x) = \frac{x+3}{x^2+5x+6}$

Domain: ________________ Domain: ________________ Domain: ________________

Function Notation

The notation *f*(*x*) represents the output of a function, named *f*, when *x* is the input.

* $g(2)$ represents the output of the function g when $x = 2$.

<u>FUNCTION NOTATION</u>. Evaluate each function. SHOW ALL WORK.

11. $f(x) = 3 - x^2$

A. Find $f(5)$.

$f(5) =$ ________

B. Find $f(3a)$.

$f(3a) =$ ______________

12. $g(x) = 5 - 3x^2$

A. Find $g(-2)$.

$g(-2) =$ ________

B. Find $g(a+2)$.

$g(a+2) =$ __________________

13. $f(x) = x^2 - 5x - 6$

If $f(x) = 0$ what is the value of x?

$x =$ _____ or _____

Multiplying Polynomials

In Algebra 1, you learned two methods for multiplying polynomials:
1) Distributive Property (used to multiply ONE term times a polynomial)
2) Generic Rectangle (used to multiply a polynomial times a polynomial)

Solving Quadratics

STEP 1: Make the quadratic equation = 0.
STEP 2: Factor the polynomial.
STEP 3: Use the Zero Product Property to solve for x. (Set each factor = 0)

EXAMPLE: Solve $x^2 + 7x + 15 = 3$
$$-3 \quad -3$$

$$x^2 + 7x + 12 = 0$$
$$(x+3)(x+4) = 0 \longleftarrow$$ Factor using a generic rectangle. (Work not shown.)

$$x + 3 = 0 \qquad x + 4 = 0$$
$$-3 \quad -3 \qquad -4 \quad -4$$

$x = -3$ or $x = -4$

MULTIPLYING POLYNOMAILS AND SOLVING QUADRATICS. Multiply each polynomial expression. For problems #14-16, solve each quadratic equation. SHOW ALL WORK.

14. $2x(x-1)$

15. $(2x-1)(3x+4)$

16. $(x+y)(x+2)$

17. $x^2 + 6x + 8 = 0$

18. $2x^2 + 5x + 3 = 0$

19. $3x^2 + 7x + 4 = 10$

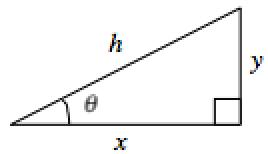
Trigonometric Ratios and the Pythagorean Theorem

Three trigonometric ratios and the Pythagorean Theorem can used to solve for the missing side lengths and angle measurements in any right triangle.

In the triangle below, when the sides are described relative to the angle θ, the opposite leg is y and the adjacent leg is x. The hypotenuse is h regardless of which acute angle is used.

PYTHAGOREAN THEOREM

$$h^2 = x^2 + y^2$$



$$\tan\theta = \frac{\text{opposite leg}}{\text{adjacent leg}} = \frac{y}{x}$$

$$\sin\theta = \frac{\text{opposite leg}}{\text{hypotenuse}} = \frac{y}{h}$$

$$\cos\theta = \frac{\text{adjacent leg}}{\text{hypotenuse}} = \frac{x}{h}$$

To find the angle measurement in a right triangle, use the inverse trig. ratios ($sin^{-1}x$).

TRIGONOMETRIC RATIOS AND THE PYTHAGOREAN THEOREM. Use right triangle trig or the Pythagorean Theorem to solve for the variables. SHOW ALL WORK.

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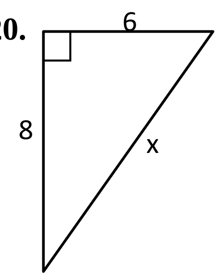

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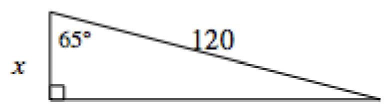

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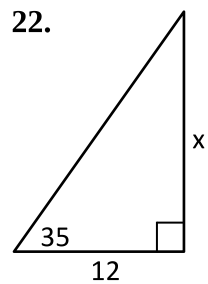

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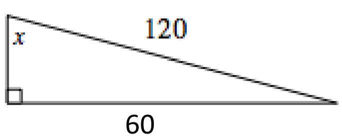

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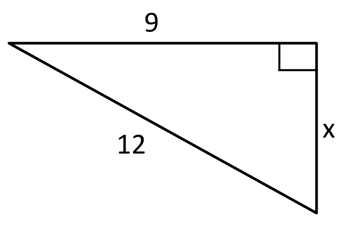

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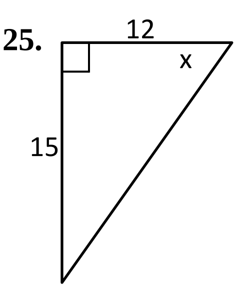

Multiplying and Dividing Rational Expressions

STEP 1: Change division problem → multiply by the reciprocal (flip the 2nd fraction).
STEP 2: Factor the numerator and the denominator.
STEP 3: Multiply the numerators. Multiply the denominators.
STEP 4: Cancel the factors that are the same by making a GIANT 1.

EXAMPLE: Simplify: $\frac{x^2+6x}{(x+6)^2} \div \frac{x^2-1}{x^2+7x+6}$

$$\frac{x^2+6x}{(x+6)^2} \cdot \frac{x^2+7x+6}{x^2-1}$$

$$\frac{x(x+6)}{(x+6)(x+6)} \cdot \frac{(x+6)(x+1)}{(x+1)(x-1)}$$

$$\frac{(x+6)}{(x+6)} \cdot \frac{(x+6)}{(x+6)} \cdot \frac{x}{(x-1)} \cdot \frac{(x+1)}{(x+1)} = \frac{x}{x-1}$$

MULTIPLYING AND DIVIDING RATIONAL EXPRESSIONS. Simplify each rational expression. SHOW ALL WORK.

26. $\frac{x^2+5x+6}{x^2-4x} \cdot \frac{4x}{x+2}$

27. $\frac{x^2-16}{(x-4)^2} \cdot \frac{x^2-3x-18}{x^2-2x-24}$

28. $\frac{x^2-2x}{x^2-4x+4} \div \frac{4x^2}{x-2}$

29. $\frac{x^2-x-6}{x^2+3x-10} \div \frac{4x-12}{2x+10}$

Adding and Subtracting Rational Expressions

Addition and subtraction of rational expressions uses the same process as simple numerical fractions.

STEP 1: If necessary find a common denominator.
STEP 2: Convert the original fractions to equivalent ones with the common denominator.
STEP 3: Add or subtract the new numerators. Keep the common denominator.
STEP 4: Factor the numerator and denominator and simplify, if possible.

EXAMPLE: Simplify: $\frac{3}{x-1} - \frac{2}{x-2}$

$$\frac{3}{x-1}\cdot\frac{x-2}{x-2}-\frac{2}{x-2}\cdot\frac{x-1}{x-1} \Rightarrow \frac{3x-6-2x+2}{(x-1)(x-2)} \Rightarrow \frac{x-4}{(x-1)(x-2)}$$

ADDING AND SUBTRACTING RATIONAL EXPRESSIONS. Add or subtract each expression. SHOW ALL WORK.

30. $\frac{2}{x+4} + \frac{3}{x-2}$

31. $\frac{5}{x+6} - \frac{3}{x+2}$

32. $\frac{3x}{2x^2-8x} + \frac{2}{x-4}$

Laws of Exponents

$x^a \cdot x^b = x^{a+b}$ $\quad$ $(x^a)^b = x^{ab}$ $\quad$ $\dfrac{x^a}{x^b} = x^{a-b}$ $\quad$ $x^0 = 1$ $\quad$ $x^{-a} = \dfrac{1}{x^a}$

<u>LAWS OF EXPONENTS</u>: Use the laws of exponents to simplify each expression. Your final answer should NOT have negative exponents in it. SHOW ALL WORK.

33. $(3x^6y^8)(2x^4y)$

34. $(4x^3y^{-2})^4$

35. $\dfrac{6x^5y^{10}z^7}{2x^5y^6z^{12}}$

36. $\dfrac{(x^3y^5)(x^4y^{10})}{(x^5y^2)^3}$

<u>SOLUTIONS</u>:

1. $y = \frac{2}{3}x + 1$

2. $y = -\frac{2}{5}x + 22$

3. $y = -3x + 14$

4. $y = -\frac{3}{2}x - 11$

5. $D: x \neq -2$
$R: y \neq 0$

6. $D: x \geq -2$
$R: y \geq -1$

7. $D: All\ real\ \#s$
$R: y > -2$

8. $D: x \neq 5$

9. $D: x \geq 4$

10. $D: x \neq -3\ or\ -2$

11. $f(5) = -22$
$f(3a) = 3 - 9a^2$

12. $g(-2) = -7$
$g(a+2) = -3a^2 - 12a - 7$

13. $x = -1\ or\ 6$

14. $2x^2 - 2x$

15. $6x^2 + 5x - 4$

16. $x^2 + 2x + xy + 2y$

17. $x = -4\ or\ -2$

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

19. $x = -3\ or\ \frac{2}{3}$

20. $x = 10$

21. $x \approx 50.71$

22. $x \approx 8.40$

23. $x = 30$

24. $x = 3\sqrt{7}\ or\ \approx 7.94$

25. $x \approx 51.34$

26. $\dfrac{4(x+3)}{x-4}$

27. $\dfrac{x+3}{x-4}$

28. $\dfrac{1}{4x}$

29. $\dfrac{x+2}{2(x-2)}$

30. $\dfrac{5x+8}{(x+4)(x-2)}$

31. $\dfrac{2(x-4)}{(x+6)(x+2)}$

32. $\dfrac{7x}{2x(x-4)}$

33. $6x^{10}y^9$

34. $\dfrac{256x^{12}}{y^8}$

35. $\dfrac{3y^4}{z^5}$

36. $\dfrac{y^9}{x^8}$