

HONORS PRECALCULUS PREREQUISITES

HONORS PRECALCULUS builds on previous mathematical learning. Below are six key themes, along with subtopics, which are essential prerequisite learning for Precalculus. Prior learning will be spiraled during the year in Precalculus, but an overall understanding of the below six themes will maximize your chances of success in Precalculus.

A sampling of prerequisite problems is included in this packet. The Prerequisite Assessment will consist of problems, which cover the main ideas of the problems in this packet. The Prerequisite Assessment will be on the second day of class and be weighed as a quiz in Marking Period 1. The first day of class will be devoted to review with ample time for question and answer periods. Please bring your completed packet with you on the first day of school to make the review as successful as possible for you.

1. **RENAMING EXPRESSIONS:** base ten number system; arithmetic with decimals, fractions, signed numbers; set notation (interval, union, intersection); basic vocabulary (e.g., the phrases “at least” and “at most,” nonnegative, integers, consecutive); percent; unit conversion; scientific notation; factoring; radicals; exponent rules; polynomials; matrices; complex numbers; completing the square technique; long division of polynomials; logarithms.
2. **SOLVING EQUATIONS AND INEQUALITIES IN ONE VARIABLE:** linear; quadratic; absolute value; exponential; logarithmic; radical; systems; rational; compound inequalities; the zero factor law. Understand extraneous solutions, and when they can arise. Be sure that you can distinguish between exact and approximate solutions. You should understand the relationship between the algebraic and graphical solutions of sentences. **YOU MUST BE ABLE TO FACTOR.**
3. **GRAPHING SENTENCES IN TWO VARIABLES:** familiarity with these “basic models”: $y = k$, $y = x$, $y = x^2$, $y = x^3$, $y = |x|$, $y = \sqrt{x}$, $y = \frac{1}{x}$, $y = \ln x$ (and other bases), $y = e^x$ (and other bases). Be able to graph circles and lines. Be able to graph transformations of the “basic models” involving: horizontal and vertical translations; vertical scaling; reflection about the x-axis; absolute value transformation. Be able to handle compound sentences that use the mathematical words ‘and’ and ‘or.’
4. **BASIC GEOMETRY FORMULAS:** perimeters of common figures, including the circumference of a circle. Also know the following formulas: AREA: rectangle, triangle, circle, trapezoid VOLUME: right cylinder (with familiar base).
5. **FUNCTIONS:** function notation; domain and range; composition; piecewise-defined functions; quadratic, $y = ax^2 + bx + c$ and $y = a(x - h)^2 + k$; higher-order polynomial (relationship between the zeros and factors); exponential and logarithmic (allowable bases, shapes of graphs); rational (asymptotes, end behavior, puncture points); periodic (sine and cosine).
6. **CALCULATOR SKILLS:** change the mode in your calculator as needed. Key in expressions using correct knowledge of order of operations. Graph functions: set the window; trace along a curve; find maxima/minima of graphs; find x-intercepts using the built-in calculator feature; use the table feature; use the Zoom In, Zoom Out, and Zoom Box features; find intersection points of graphs.

Name: _____

Monroe Township High School Mathematics Department
Honors Precalculus Summer Preparation Packet for the 2025-2026 School Year

An assessment will be given on the following prerequisite material at the beginning of the school year without a calculator.

Answers are at the end of the document for you to check your work. Make corrections to your work, if necessary. Your answer must be supported by your work.

Simplifying Radicals/Operations with Radicals

Simplify. Answers should be in simplest radical form.

1. $\sqrt[3]{108}$

2. $2\sqrt{45} + 2\sqrt{24} - \sqrt{125}$

3. $\frac{5\sqrt{6}}{\sqrt{22}}$

4. $(-6\sqrt{3} + \sqrt{6})(-6\sqrt{3} - \sqrt{6})$

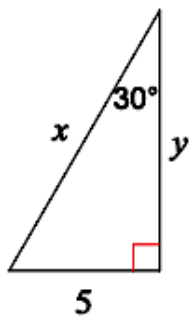
5. $(\sqrt{5} + \sqrt{3})^2$

6. $\frac{3+\sqrt{8}}{2-2\sqrt{8}}$

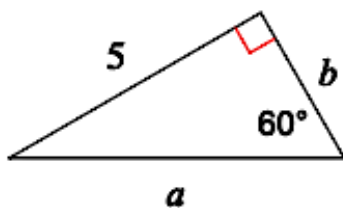
Special Right Triangles (45-45-90 and 30-60-90)

Find the missing side lengths. Answers should be in simplest radical form. No decimals.

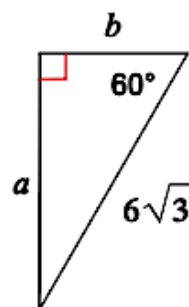
7.



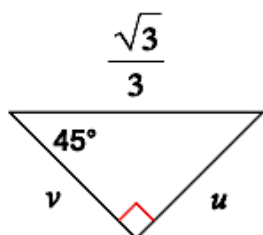
8.



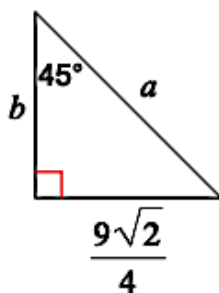
9.



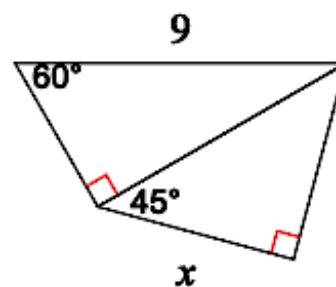
10.



11.



12.



Right Triangle Trigonometry Applications

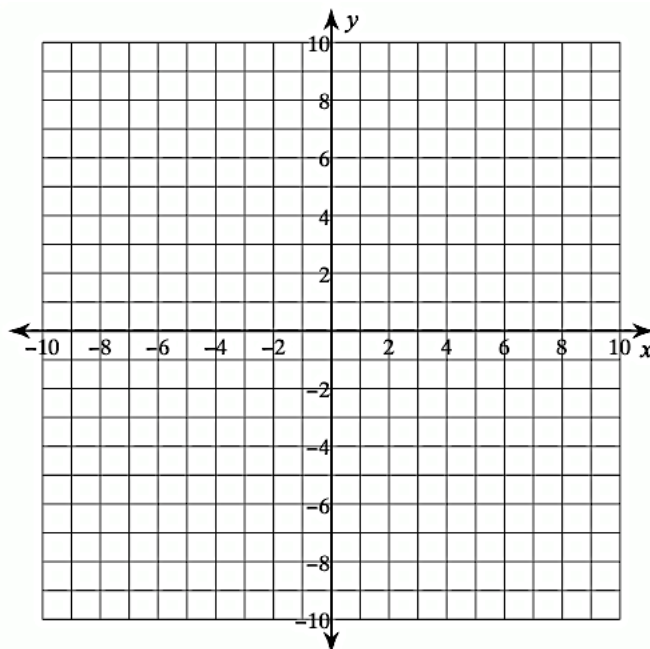
13. A lighthouse keeper observes that there is a 30° angle of depression between the horizontal line and the line of sight to a ship. If the lighthouse keeper is 19 meters above water, how far is the ship from the shore?
14. A zip-line steel cable is being constructed for a reality television competition show. The high end of the zip-line is attached to the top of a 50-foot pole while the lower end is anchored at ground level to a stake 50 feet from the base of the pole. All answers should be in simplest radical form.
- Find the angle of elevation of the zip-line.
 - Find the number of feet of steel cable needed for the zip-line.
 - A contestant takes 6 seconds to reach the ground from the top of the zip-line. At what rate is the contestant moving down the line? At what rate is the contestant dropping vertically?

Graphing

Note: It is recommended that you know how to graph without the use of a graphing utility. You are advised to use a graphing utility to check your work.

Graph. State the domain and range in interval notation.

15. $f(x) = -2x^2 + 16x - 33$



domain: _____

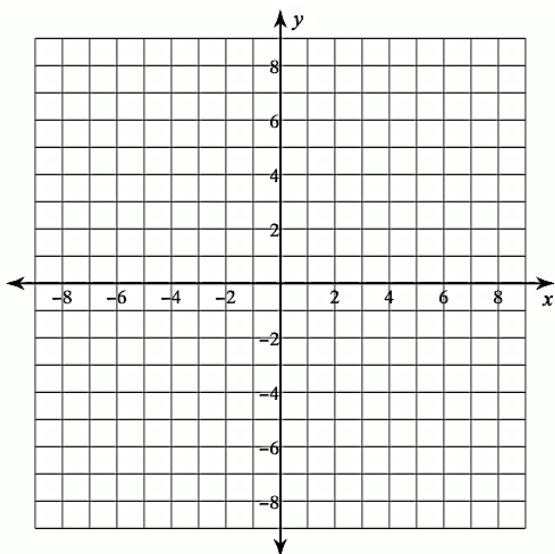
range: _____

Graph the given function **and** its parent function on the same coordinate plane. Identify the parent function and given function on the graph. State the domain and range in interval notation of $g(x)$ and $h(x)$.

16. $g(x) = -\frac{1}{2}(x - 1)^2 - 2$

parent function: _____

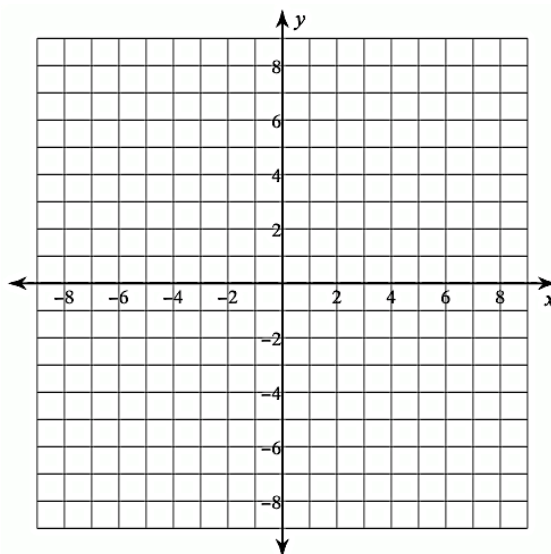
domain: _____ range: _____



17. $h(x) = |6x + 12| - 7$

parent function: _____

domain: _____ range: _____



Simplifying*Simplify.*

$$18. \frac{\frac{x+6}{x} - \frac{1}{x+2}}{\frac{x^2+4x+3}{x^2+2x}}$$

$$19. \frac{1 - \frac{y}{x}}{\frac{1}{y} + \frac{1}{x}}$$

Polynomial Division*Perform the indicated operation.*

$$20. \frac{2x^4 - x^3 + x^2 + x - 3}{x^2 - 1}$$

$$21. (3x^5 - 20x^3 - 58x + 1)(x - 3)^{-1}$$

Finding Zeros

Given one zero, find the other zeros.

22. $f(x) = 2x^3 + 11x^2 + 18x + 9$; zero: -3

23. $f(x) = x^3 - 14x^2 + 47x - 18$; zero: 9

Factoring

Factor completely.

24. $8x^4 - 27x$

25. $-3x^5y + 243xy$

Solving

Solve by factoring.

26. $6x^3 - 3x^2 - 4x = -2$

27. $6x^2 - 7x - 20 = 0$

Operations with Fractions

Simplify.

28. $\frac{1}{6} + \frac{5}{3} - \frac{2}{9}$

29. $-\frac{5}{3} + \left(-\frac{7}{8}\right)$

30. $\left(\frac{5}{4}\right)^2 \div \left(\frac{1}{2}\right)^3$

31. $\frac{2}{9} + \frac{20}{3} \cdot \frac{12}{5}$

Answers

1. $3 \cdot \sqrt[3]{4}$

2. $\sqrt{5} + 4\sqrt{6}$

3. $\frac{5\sqrt{33}}{11}$

4. 102

5. $8 + 2\sqrt{15}$

6. $\frac{-11-8\sqrt{2}}{14} = \frac{-11}{14} - \frac{4\sqrt{2}}{7}$

7. $x = 10, y = 5\sqrt{3}$

8. $a = \frac{10\sqrt{3}}{3}, b = \frac{5\sqrt{3}}{3}$

9. $a = 9, b = 3\sqrt{3}$

10. $u = \frac{\sqrt{6}}{6}, v = \frac{\sqrt{6}}{6}$

11. $a = \frac{9}{2}, b = \frac{9\sqrt{2}}{4}$

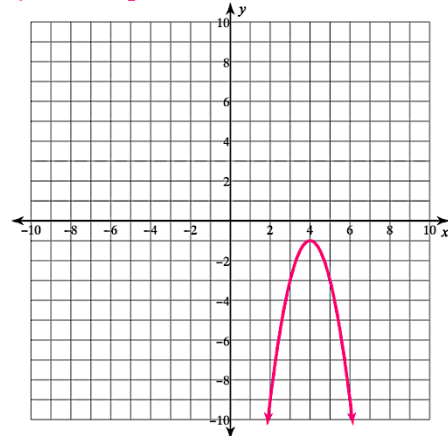
12. $x = \frac{9\sqrt{6}}{4}$

13. $19\sqrt{3}$ meters

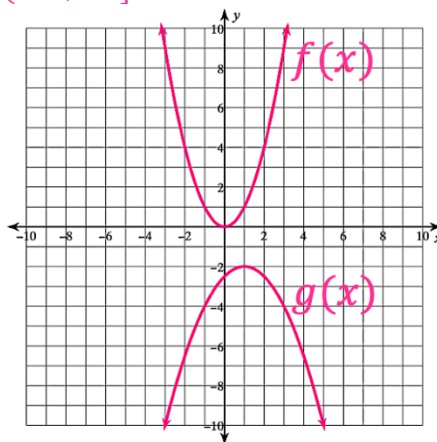
14. a. 45° , b. $50\sqrt{2}$ feet,

c. moving $\frac{25\sqrt{2}}{3}$ feet/second down the line, dropping $\frac{25}{3}$ feet/second vertically

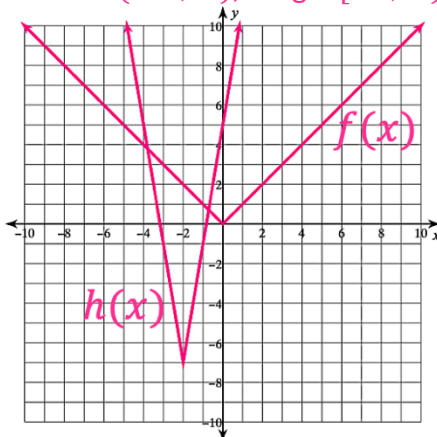
15. domain: $(-\infty, \infty)$, range: $(-\infty, -1]$



16. parent function: $f(x) = x^2$,
domain: $(-\infty, \infty)$, range:
 $(-\infty, -2]$



17. parent function: $f(x) = |x|$,
domain: $(-\infty, \infty)$, range: $[-7, \infty)$



18. $\frac{x+4}{x+1}$

19. $\frac{y(x-y)}{x+y}$

20. $2x^2 - x + 3$

21. $3x^4 + 9x^3 + 7x^2 + 21x + 5 + \frac{16}{x-3}$

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

23. $x = \frac{5 \pm \sqrt{17}}{2} = \frac{5}{2} \pm \frac{\sqrt{17}}{2}$

24. $x(2x - 3)(4x^2 + 6x + 9)$

25. $-3xy(x^2 + 9)(x + 3)(x - 3)$

26. complete factorization:

$(3x^2 - 2)(2x - 1) = 0$,

$x = \pm \frac{\sqrt{6}}{3}, \frac{1}{2}$

27. complete factorization:

$(2x - 5)(3x + 4) = 0$,

$x = -\frac{4}{3}, \frac{5}{2}$

28. $\frac{29}{18}$

29. $-\frac{61}{24}$

30. $\frac{25}{2}$

31. $\frac{146}{9}$