

PRE-CALCULUS HONORS

Summer Work and List of Topical Understandings

For students to successfully complete the objectives of the Pre-Calculus curriculum, the student must demonstrate a high level of independence, capability, dedication, and effort. This summer packet will help you maintain/improve your skills. **This packet is a requirement for those entering the Pre-Calculus course and is due on the second day of class.** Your attempt to complete this packet by the second day will be combined with an assessment on the material to form your first grade of the Pre-Calculus course. Feel free to use outside resources in your preparation for and completion of this packet, but be aware that you are required to demonstrate these skills on your own! **IF YOU NEED MORE SPACE THAN WHAT IS PROVIDED, PLEASE ATTACH SEPARATE SHEETS OF PAPER!!**

Requirements

The following are guidelines for completing the summer work packet...

- ✓ Be sure all problems are neatly organized and all writing is legible.
 - ✓ We expect you to come in with certain understandings that are prerequisite to Pre-Calculus. A list of these topical understandings is below.
 - ✓ Students will also be required to complete an online assignment upon their return to school which will be graded as a summative grade in addition to the Summer Packet and corresponding in-class assessment.
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These are the following skills that you will be required to understand in order to be successful in the coming year...

Skill 1: Fraction and Exponent Computation **Without** Calculator

Skill 2: Linear Equations

Skill 3: Systems of Equations

Skill 4: Polynomial, Rational and Radical Expressions

Skill 5: Laws of Exponents and Basic Logarithms

Skill 6: Graphing Functions and Transformations

Skill 7: Interval Notation, Inequality Notation, and Domain and Range

Skill 8: Special Right Triangles, Basic Trigonometry, Inverse Trigonometry

Skill 9: Operations with Complex Numbers

Skill 10: Completing the Square and Quadratic Inequalities

Recommended Timeline:

Week of July 29th: Skills 1 and 2

Week of August 5th: Skills 3 and 4

Week of August 12th: Skills 5 and 6

Week of August 19th: Skills 7 and 8

Week of August 26th: Skills 9 and 10

Practice Set of Required Math Skills for
Pre-Calculus Honors

Skill 1:

All students should be able to complete operations involving fractions and recall exponent facts quickly and accurately *without the use of a calculator*.

1. $\frac{7}{16} + \frac{1}{20}$

2. $2\frac{2}{3} - \frac{5}{3}$

3. $\frac{4}{5} \times \frac{20}{7}$

4. $\frac{3}{5} \div \frac{1}{2}$

5. $\frac{16}{3} \div 2$

6. $5 \times \frac{1}{15}$

7. $\left(\frac{3}{4}\right)^2$

8. $\left(\frac{3}{2}\right)^{-1}$

9. $\left(\frac{5}{7}\right)^0$

10. 6^{-3}

11. -3^4

12. $(-3)^4$

13. 2×3^3

14. $x^4 = 16$

15. $x^3 = -216$

16. $4^x = \frac{1}{64}$

Simplify:

17. $\sqrt{300}$

18. $\frac{\sqrt{192}}{2}$

19. $\frac{18}{\sqrt{2}}$

20. $\frac{\sqrt{3}}{2} \div \frac{1}{2}$

21. $\frac{4}{5 + \sqrt{3}}$

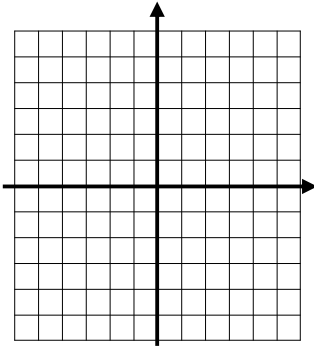
22. $\frac{5 - \sqrt{7}}{3 + \sqrt{2}}$

Skill 2:

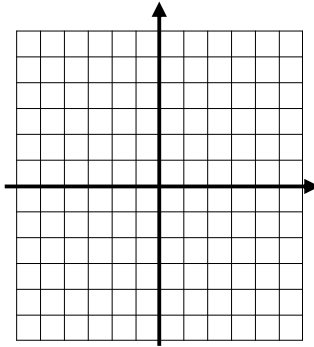
All students should be familiar with all concepts of graphing linear equations in various forms, including graphically, in equations (slope-intercept, point-slope and standard form) and formulas, and numerically in a chart of ordered pairs.

Graph each of the following:

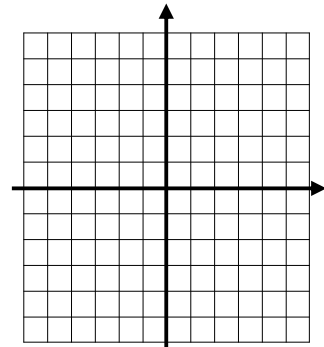
1. $f(x) = -\frac{4}{5}x - 1$



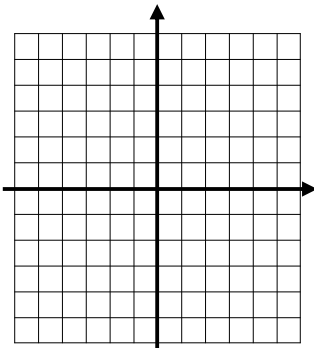
2. $y - 1 = 2(x - 4)$



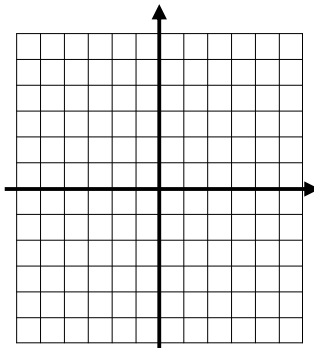
3. $4x - 3y = -12$



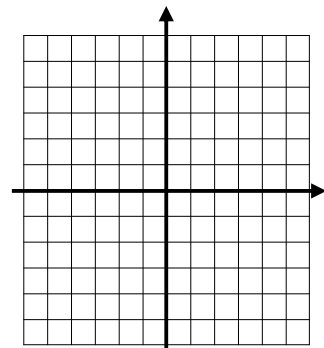
4. $x - y = 5$



5. $x = 4$



6. $f(x) = -3$



Write the equation of each line indicated. Give answers in slope-intercept form for odds and point slope form for evens.

7. A linear function for which $f(1) = 7$ and $f(-1) = 5$.

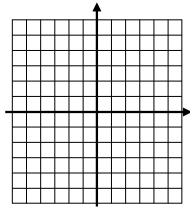
8. A line perpendicular to $2y = 5x - 1$ passing through the origin.

9. The line with x intercept 3 and y intercept -2.

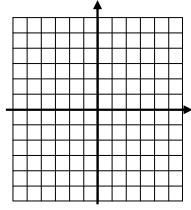
10. The line parallel to $y = -2x + 2$ and containing (4, 1).

Shade the half-plane that represents the solution to the linear inequality.

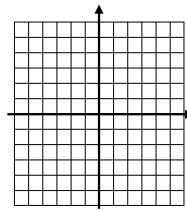
11. $y \geq 2x - 1$



12. $2x - 3y < -6$



13. $x > 2$



Skill 3:

All students should be able to solve a system of equations.

1. $-3x + 3y = -18$
 $4x - y = 5$

2. $3y + 2x = 12$
 $y = \frac{1}{3}x - 2$

Skill 4:

All students should be able to multiply, factor add and subtract polynomials and to use these skills to simplify expressions and solve equations involving quadratic, polynomial, and rational terms.

Factor:

1. $b^2 + 11b - 26$

2. $t^2 - 17t + 30$

3. $x^2 - 81$

4. $36m^2 - 25n^{12}$

5. $5x^2 - 7x - 6$

6. $100x^2 - 75$

7. $3x^2 - 5x - 2$

8. $9 + 8x - x^2$

9. $x^3 - 64$

Multiply, Add, subtract or divide.

10. $(3x^2y + 2xy^2 - 7xy) - (-4x^2y - 2xy^2 + 8xy)$

11. $(2x + 1)^2$

12. $(3x^5 - 5yz^2)(3x^5 + 5yz^2)$

13. $(3x + 1)^3$

14. $\frac{x}{4 + y} - \frac{2x}{4 + y}$

15. $\frac{2}{x^2 + 2x} + \frac{x}{4x + 8}$

$$16. \quad \frac{5}{x^2 - 4} + \frac{3}{x - 2}$$

$$17. \quad \frac{\frac{1}{2} - \frac{x+5}{4}}{\frac{x^2}{2} - \frac{5}{2}}$$

$$18. \quad \frac{\frac{25}{12} + \frac{x+1}{4}}{\frac{1}{18} - \frac{x+1}{36}}$$

$$19. \quad \frac{3x^2 - 5x - 2}{(x^2 - 4)(6x + 2)}$$

Solve. Where necessary, leave your answer in simplest radical form or as $a + bi$:

$$20. \quad 3x(x - 1) - x(x - 8) = 3$$

$$21. \quad 2x^2 - 7x = 15$$

$$22. \quad 4x^2 = 20$$

$$23. \quad x^3 - 5x = 0$$

$$24. \quad x^2 - 144 = 0$$

$$25. \quad x^4 - 17x^2 + 16 = 0$$

$$26. \quad 6 + 2\sqrt{2x - 5} = 12$$

$$27. \quad \sqrt{-2x + 5} = x + 5$$

$$28. \quad \sqrt{144 - x^2} = 10$$

$$29. \quad \sqrt{x^2 + 7} = x + 1$$

Skill 5:

All students should be able to apply the rules of exponents and evaluate basic logarithms. (Give answers with no negative exponents)

- | | | | | | |
|-----|------------------------------------|-----|--|-----|---------------------------------|
| 1. | $x^8 \cdot x^{n-3}$ | 2. | $\left(\frac{49}{4}\right)^{-\frac{1}{2}}$ | 3. | $(-2x^4)^3$ |
| 4. | $\frac{y^{12}}{y^3}$ | 5. | $\frac{y^{4+2x}}{y^2}$ | 6. | $\frac{x^5 y^{-3}}{w^0 z^{-1}}$ |
| 7. | $\frac{t^{-5} v^{-2}}{t^6 v^{-7}}$ | 8. | $\frac{(-2x^{-3})^2}{x^9}$ | 9. | $\frac{t^{-1} - v}{v}$ |
| 10. | $(x+4)^2$ | 11. | $(x-5)^{-2}$ | 12. | $(3x^{-3})^{-2}$ |

Evaluate or Solve

- | | | | | | |
|-----|--------------------------------|-----|--|-----|--------------------------|
| 13. | $x^{\frac{3}{4}} = -8$ | 14. | $2(1-x)^3 = 2,000$ | 15. | $2^{x+4} = 4 \cdot 16^x$ |
| 16. | $\frac{1}{27} = \frac{3^x}{9}$ | 17. | $\left(\frac{2}{3}\right)^{x-2} = \left(\frac{9}{4}\right)^{2x-1}$ | 18. | $3 \cdot 9^{2x+1} = 27$ |

Skill 6:

Graphing: Sketch a graph, showing the coordinates of two or more important points or asymptotes.

- | | | | | | |
|----|--------------------|----|-----------------------|----|--------------------|
| 1. | $y = x^2 + 4$ | 2. | $y = (x+3)^2$ | 3. | $y = x^2 - 4x + 3$ |
| 4. | $y = 2(x-4)^2 - 1$ | 5. | $y = 2x^2 - 12x + 16$ | 6. | $y = 2 - x+4 $ |

Skill 7:

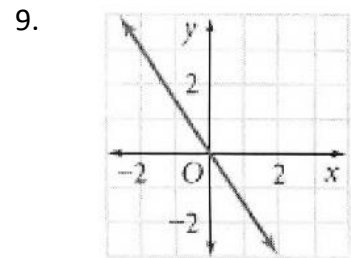
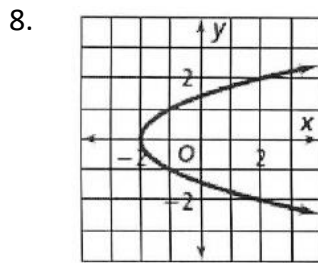
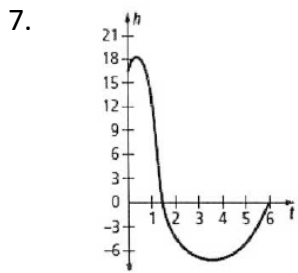
Put the following in interval notation and graph the solution set on a number line.

1. $-3 \leq x < 4$ 2. $x > 12$ or $x \leq -8$ 3. $x \leq 14$ or $x > 6$

Put the following into inequality notation and graph the solution set on a number line.

4. $(2, 9]$ 5. $(-3, 5] \cup [6, 10]$ 6. $[-7, 1] \cup (6, \infty)$

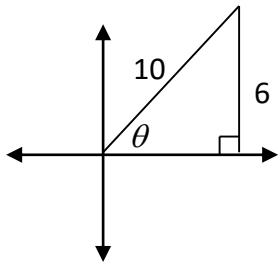
Given the pictured function below, write the domain and range in interval notation.



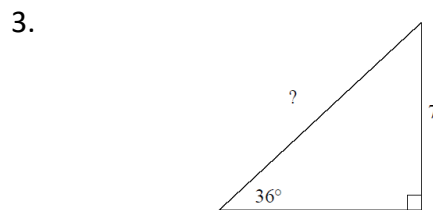
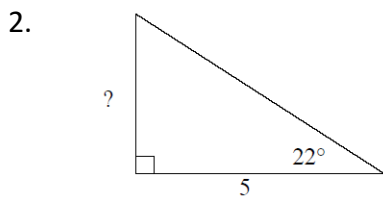
Skill 8:

Students should be familiar with special right triangles, right triangle trigonometry and inverse trigonometry.

1. Find $\sin \theta$, $\cos \theta$, and $\tan \theta$.



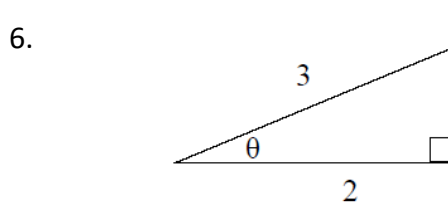
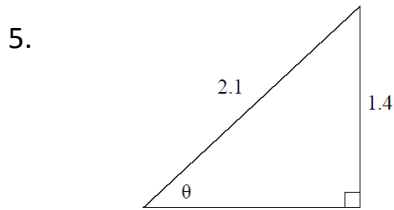
Find the value of indicated side using basic trigonometry. Round to two decimal places:



4. A damsel in distress locked in a high tower is being rescued by a mathematically gifted knight.

He stands 25 feet from the base of the tower and measures the angle of elevation from the ground to the window where the damsel is to be 74° . Based on this information, determine how high up the damsel is in the tower and how long the ladder will have to be in order for the knight to reach her.

Use inverse trigonometry to determine the measure of the angle Round to one decimal place.



Skill 9:

Simplify. If necessary, leave in $a + bi$ form:

7. $(-3i^3)^5$

8. $7i^7 + 15i^{15}$

9. $\frac{18i^{12}}{6i^3}$

10. $(-2i^3)^2(5i)$

11. $(7+5i)+(8-3i)$

12. $(3+\sqrt{-64})-(10-\sqrt{-25})$

13. $2\sqrt{-3}-\sqrt{-27}+3\sqrt{-12}$

14. $(5+2i)+(7-4i)-(12-8i)$

15. $\frac{5}{2i}$

16. $\frac{4+i}{5-2i}$

17. $(6-i)^2$

18. $\frac{2i}{4-i}$

19. $(4+9i)(3-2i)$

Skill 10:

Solve each equation by completing the square.

1. $x^2 - 6x = -4$

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

3. $2x^2 - 20x = 8$

Write each parabolic equation in vertex form:

4. $g(x) = x^2 - 3x + 16$

5. $h(x) = 3x^2 - 12x - 4$

Using any method you choose, graph the quadratic inequalities on a number line.

6. $x^2 - x - 56 > 0$

7. $3x^2 \geq -4x - 1$

8. $x^2 + 3x \geq -2x - 4$

Using any method you choose, graph the quadratic inequalities on a plane.

9. $y > x^2 - 2x - 3$

10. $y \geq 2x^2 - x + 3$

11. $y \geq 2x^2 - 2x - 5$