

Summer Work for Precalculus

Precalculus is a very challenging course. This packet is intended to give you practice for those topics that you need to be familiar with before class begins. These sections from your Precalculus textbook were covered in Algebra II and will not be retaught in Precalculus. Be sure you are comfortable with all of this material! You will be tested on it within the first month and throughout the year. Use your new text *Advanced Mathematical Concepts* as a reference if necessary from the following sections:

Chapter 1 Linear Functions and Relations (all)

Chapter 2 Systems of Equations 2.1-2.4

Chapter 4 Polynomial and Rational Functions 4.1,4.2,4.4, 4.5, 4.6

Chapter 10 Conics 10.1-10.5, 10.7

Chapter 11 Exponential and Logarithmic Functions 11.1, 11.4, 11.6

When completing your summer work packet keep the following things in mind:

- This is a **100 point** assignment due the **first day of class**. No exceptions. Failure to do so will result in a zero as your first major grade.
- Do each problem on separate paper showing all required work. Problems requiring work will be counted wrong with no work.
- **No Calculators!**
- All graphs should be done on graph paper with work beside it.
- Problems should be neat and in order.
- When you complete your work check your answers on the Heritage website (mrs. Rich's website). Make necessary corrections.

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Chapter 1

Do on separate paper neat in order and showing all required work.

State **all** values that are NOT in the domain of the following functions:

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

2. $y = \sqrt{x^2 - 16}$

3. $y = \frac{4}{|2x+1|}$

4. $y = \frac{x-4}{\sqrt{x^2-25}}$

5. $y = \frac{2x-6}{x^2-x-30}$

6. Find the distance between (-2, 3) and (11, 2)

In the following problems $f(x) = 2x - 3$ and $g(x) = x^2 - 1$. Find each of the following. Simplify as much as possible. No parentheses in your final answer.

7. $f[g(x)]$

8. $g[f(x)]$

9. $f^{-1}(x)$

10. $g^{-1}(x)$

Write the equation of the line described below in Slope Intercept form:

11. Passing through(2,-5) and (6, 1).

12. Slope of -2/3 through (10,5)

13. Passing through (0, -3) and (4, -3)

14. Passing through (-4, 1) and perpendicular to the line
 $3x - 12y - 4 = 0$

15.No Slope passing through (-2,2)

Find the equation of the following lines in Standard Form

16.Parallel to $6x - 3y = 2$ through (1,1)

17.x-intercept of 12, y-intercept of 4

14. Find the area of a triangle with vertices located at $(-4, -8)$, $(-6, 2)$, $(-1, -3)$

15. Solve for the variables $\begin{bmatrix} 3x+5 & 5y+6z \\ 45 & -3 \end{bmatrix} = \begin{bmatrix} 14 & 14 \\ 10y-5z & -3 \end{bmatrix}$

16. Solve the matrix equation

$$\begin{bmatrix} 2 & 5 \\ -1 & -3 \end{bmatrix} \bullet \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$$

Chapter 4

Show all work on separate paper

Solve give both real and imaginary solutions:

1. $4x^2 + 36 = 0$

2. $5x^3 = 125x$

3. $4x^2 - 3x + 2 = 0$

4. $x^2 - 4x = 10$

Write a polynomial equation of least degree for each set of roots given. Multiply out roots completely.

5. $5, -3$

6. $2 + i, 2 - i$

7. $2, 4 + i, 4 - i$

8. $3 + i, 3 - i, i, -i$

Divide using synthetic division, write your answer as a mixed number:

9. $(2x^3 - 5x^2 + 7x + 1) \div (x - 5)$

10. $(4x^3 - 7x + 1) \div (x + \frac{1}{2})$

Use the REMAINDER THEOREM to find the remainder for the following. Do not divide out.

11. $(x^6 - 3x^2 + 6) \div (x + \sqrt{3})$

12. $(x^{23} - x^{15} + 3) \div (x + 1)$

Use the REMAINDER THEOREM to find k so that the remainder is the given number:

13. $(2x^3 - 3x^2 + kx - 5) \div (x - 1)$ remainder = 0

14. $(x^4 - 3x^2 + kx + 7) \div (x + 2)$ remainder = 1

List all POSSIBLE rational roots. Do not solve the equation.

15. $f(x) = 6x^4 - 2x^3 + 3x^2 - 8$

Make a chart listing all possible combinations of roots (positive, negative, or imaginary) for the equation. Do not solve the equation.

16. $f(x) = 2x^3 - 3x^2 + x - 7$

17. $f(x) = x^5 - 3x^3 + x^2 - 3$

Find ALL zeros real and imaginary

18. $f(x) = x^3 - 2x^2 - 5x + 6$

19. $f(x) = x^3 + x^2 - x - 10$

20. $f(x) = x^4 + 8x^2 - 9$

Chapter 10

Write an equation of a parabola in standard form having the following:

1. Vertex (9,-1) and focus at (4, -1)
2. Axis of symmetry of $x = 0$ passing through the points (1,1) and (-1,1)

Write the equation of a circle having the following:

3. Center (1, -2) radius of $2\sqrt{3}$
4. Center of (2, 2) and radius of 4
5. The ends of a diameter are (2,0) and (4, 6)

Write the equation of an ellipse with the following:

6. Major axis = 4, Minor axis = 2 center (0,2)
7. Foci of (7, 0) and (-7, 0) and endpoints on the vertical axis of (0, 7) and (0, -7).

Write the equation of a hyperbola with the following:

8. Vertices (3, 0) and (-3, 0) and asymptote $y = 2/3x$
9. The center is at the origin with a vertical transverse axis. The equations of the asymptotes are $8x + 2y = 0$ and $8x - 2y = 0$

GRAPH the following conics on graph paper. First tell which type of conic it is (circle, parabola, hyperbola or ellipse). If necessary show work completing the square to put the equation in standard form. On the graph clearly tell the key points (vertices or centers).

10. $y = 2x^2 + 4x - 2$

11. $y = 2(x-1)^2 + 3$

12. $(x - 2)^2 + (y + 3)^2 = 16$

13. $16(y+1)^2 - 4(x -6)^2 = 64$

14. $x^2 + y^2 - 2x + 8y + 17 = 36$

15. $x = y^2 + 4y + 3$

16. $\frac{(x-2)^2}{9} + \frac{(y-4)^2}{4} = 1$

17. $3x^2 + y^2 + 30x - 12y + 108 = 0$

Chapter 11

Show ALL work on separate paper

Simplify. Put all answers in simplest radical form:

1. $y^{\sqrt{6}} \cdot y^{\sqrt{18}}$

2. $16^{\sqrt{2}} \div 4^{\sqrt{2}}$

3. $4^{\frac{1}{3}} a^{\frac{2}{3}} y^{\frac{4}{3}}$

4. $\sqrt{a^3 b^2} \cdot \sqrt{a^4 b^5}$

5. $\sqrt[3]{81c^6 d^8}$

6. $\frac{2a}{8\sqrt[3]{a}}$

Find all real solutions of the following:

7. $2^{2x} + 6(2^x) = 7$

8. $27^{-2x} = 9^{-4x-1}$

10. Write in logarithmic form: $2x = 245$

11. Write in exponential form: $\log_5(x+2) = 12$

Evaluate the following:

12. $\log_x 81 = 4$

13. $\log_{1/2} x = -4$

14. $\log_3 3 + \log_3 x = \log_3 45$

15. $\log_5 125$

16. $2\log_6 4 - 1/3 \log_6 8 = \log_6 x$

17. $\log_2 x = 1/3 \log_2 27$

18. $\log_2(x + 4) - \log_2(x) = 5$

19. Use the change of bases formula to rewrite using a base of 10: $\log_3 12$

Solve for x using logarithms. Keep answer in terms of logs do not use a calculator.

20. $3^{4x} = 5^{(x-1)}$

21. $5^{(x-3)} = 72$

22. $7^{(x-2)} = 5^{(3-x)}$

Additional Questions

1. What does the domain of a function mean?

2. Explain how to find the domain of a function in the form $\frac{f(x)}{g(x)}$ where both $f(x)$ and $g(x)$ are polynomials. _____

3. Explain how to find the domain of a function that contains a square root with a variable in its radicand.

4. What is the difference between domain and abscissa?

5. Specifically what is the domain of any polynomial? _____
6. What does the range of a function mean? _____

7. If the vertex of a parabola is (h,k) , what is the range? Give both cases and explain. _____

8. What is the range of a polynomial with an odd degree? _____

9. What is a composite function? _____

10. Algebraically, how do you find the inverse of a function?

11. What does the inverse of $f(x)$ actually do? _____

12. Explain the test used to determine if a relation is a function. Don't just give the name of the test, explain how it is used. _____

13. Explain the test used to determine if the inverse of a given graph is a function without finding the actual inverse. Don't just give the name of the test, explain how it is used.

14. Give the piecewise definition of $|x|$. (redefine)

15. If a function contains the absolute value of a linear expression, what is the shape of the graph? _____
16. Define Rational Number. _____

17. What is the equation of the line of symmetry of a relation and its inverse? _____
18. When solving a system of two equations with two unknowns, what are you actually finding? _____

19. What is the difference between real roots and imaginary roots when graphing a polynomial? _____

20. Explain why a polynomial of odd degree must cross the x-axis at least once. _____

21. How do you determine the possible number of positive real roots that a polynomial can have? _____

22. Why do the imaginary roots come in pairs? Be specific.

23. If the roots of a quadratic equation are rational, what does it tell you about the original equation? _____

24. What kind of graph is a quadratic equation? _____

In #26-29, use $Ax^2 + By^2 + Cx + Dy + E = 0$, to explain how you can tell if its graph is the following.

25. A parabola _____

26. An ellipse _____

27. A circle _____

28. A hyperbola _____

29. If $f(x)$ is divided by $(x - a)$ synthetically, how can you use the remainder to check your work? _____

30. List 4 Pythagorean Triples (that are not multiples of others).

31. Name four ways triangles can be congruent.

Using the following figures, quadrilateral, trapezoid, isosceles trapezoid, rectangle, square, rhombus, parallelogram, list **all** of the figures for which the following is true.

32. Diagonals bisect each other

33. Diagonals are congruent.

34. Diagonals bisect opposite angles.

35. Opposite angles are congruent.

36. All sides are congruent.

37. All angles are congruent.

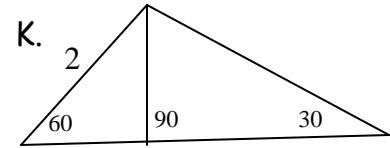
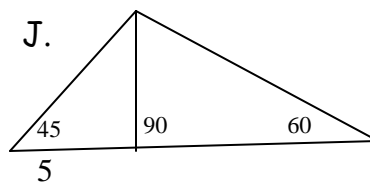
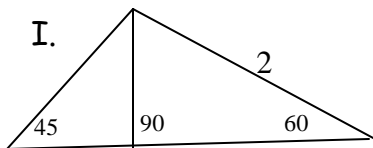
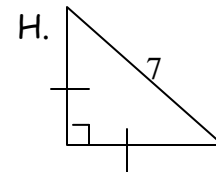
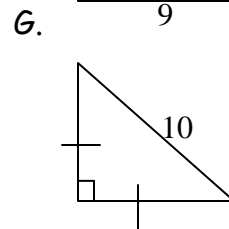
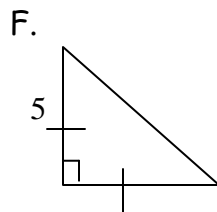
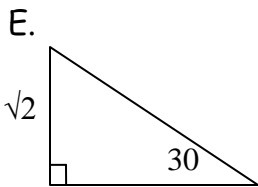
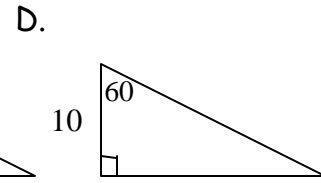
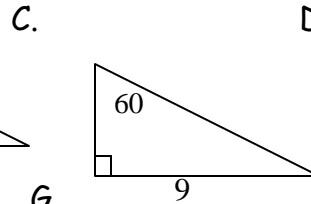
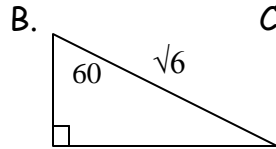
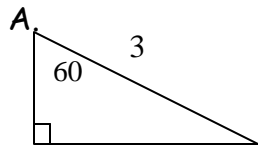
38. Diagonals are perpendicular to each other.

39. Opposite sides are parallel.

40. Base angles are congruent.

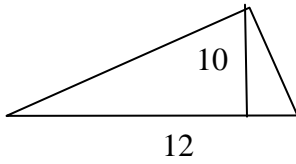
41. Consecutive angles are supplementary.

42. Fill in the missing sides of the triangles. Give exact answers only.
All answers must be rationalized.

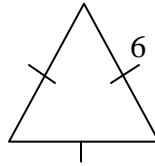


44. Find the exact area of each of the following figures.

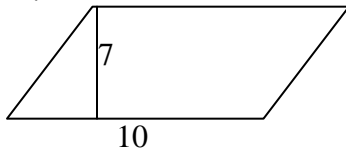
A.



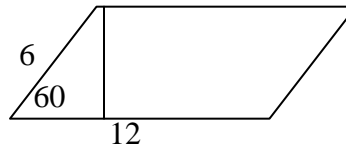
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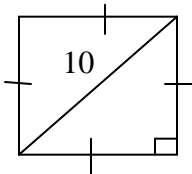
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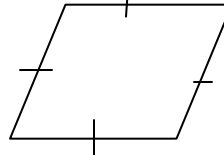
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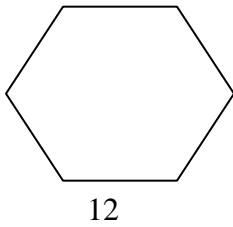
E.



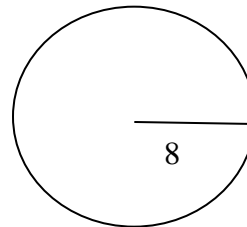
F. rhombus with diagonals 12 and 16



G. regular hexagon



H.



Check on Mrs. Rich's website for answers!