Honors Precalculus

Summer Review Packet

DUE THE FIRST DAY OF SCHOOL

The problems in this packet are designed to help you review topics from previous mathematics courses that are important to your success in *Honors Precalculus*. DO ALL PROBLEMS WITHOUT A CALCULATOR. Show all work that leads you to each solution on separate sheets of paper. You may use your notes from previous mathematics courses to help you. Any of these may appear on quizzes.

ENJOY YOUR SUMMER!! WE ARE LOOKING FORWARD TO SEEING YOU IN THE FALL.

USE A SEPARATE SHEET OF PAPER AND SHOW ALL WORK.

I. Polynomials and operations on real and imaginary numbers.

A. Simplify these expressions

1. $\sqrt{-100}$
2. $\sqrt{-4 \bullet -9}$
3. $(i\sqrt{7})^2$
4. $\sqrt[3]{2x} \bullet \sqrt[3]{4x^2y^2} \bullet \sqrt[3]{2y^4}$
5. $(3 + 2i) + (5 + 7i)$
6. $2i\,(3 - i)$
7. $(3 + 2i)\,(3 - 2i)$
8. $\sqrt{\frac{-r}{5}} \bullet \sqrt{\frac{-20}{r}}$
9. $\frac{8}{-2i}$
10. $(3 + i\sqrt{5})^2$
11. $-\sqrt{-9}$
12. $\frac{5i}{6 - 2i}$ (Hint: Use the conjugate of denominator)

B. Factor Completely

1. $t^2 - 4t - 21$
2. $x^3 - 8$
3. $27x^3 + 125$
4. $x^3 - 2x^2 - 4x + 8$

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C. Simplify the following expressions.

1. $5x^2 \bullet 2x^5$
2. $(-2c^3)^2$
3. $\frac{4^{h-k}}{4^{h+k}}$
4. $\frac{10 \bullet 2^6}{8 \bullet 2^{-2}}$
5. $t^3 \bullet t^{n-3}$
6. $(x^m)^n \bullet (x^n)^{n-m}$

D. Divide and simplify these expressions.

1. $\frac{x^2+2x-1}{x+3}$
2. $\frac{3x^4-2x^3+16x-192}{x^2-8}$

E. Solve each quadratic equation for x

1. $(x - 1)(5x + 3) = 0$
2. $2x(x-4)=3(1-x)$
3. $2x^2 + 4x = -3$
4. $2x^2 - 32x = 0$

F. Graph the functions using a table of values, symmetry, rational zero theorem, or other properties of polynomials to plot points. Verify the graph with the calculator. Describe the following characteristics for each function:

a. domain and range b. zeros c. y-intercept d. end behavior
e. intervals where the function is increasing / ... decreasing

1. $f(x) = x^3 - 3x^2 - 4x + 12$
2. $f(x) = x^2+2x+1$
3. $f(x) = 3x^2 + 2x + 1$
4. $f(x)=\sqrt{x-5}$
5. $f(x)=-\sqrt{x-5}$
6. $f(x)=\sqrt{x}+5$

II. Function Operations

A. If $f(x) = x^2 - 4$ and $g(x) = \sqrt{2x+4}$, determine

1. f(3)
2. f(x) = 0 when x = ?
3. f(g(4))
4. f(g(x))
5. Domain of f(g(x))
6. g(f(0))
7. g(f(a + 2))
8. $f^{-1}(x)$

How could the domain of f be restricted to make its inverse a function?

B. Write the function **$h(x) = (x + 4)^3 - 2$** as the composition of two functions f and g so that f(g(x)) = h(x). Identify the functions f(x) and g(x).

III. Rational Expressions and Rational Functions

A. Graph the following functions using a table of values. Identify:

a. intercepts b. asymptotes

1. $f(x)=\frac{2x}{x+4}$
2. $h(x)=\frac{3x}{x^2+1}$
3. $k(x)=\frac{4x^2}{x^2-9}$

B. Simplify. Write your answer as a single fraction.

1. $\frac{3x^2+6x^3}{9x}$
2. $\frac{x^2-25}{x^2+7x+10}$
3. $\frac{2x}{x+5} \div \frac{6x^2}{2x+10}$
4. $\frac{\frac{3}{x+2}}{\frac{6}{x}}$
5. $\frac{x-2}{x}+\frac{x+4}{2x}$
6. $\frac{4x}{x+6}+2$
7. $\frac{2x}{x-3}-\frac{x}{x+3}$

IV. Rewriting and Solving Equations

A. Solve each equation for y.

1. $7y + 6x = 10$
2. $\frac{1}{4}y - 7x = \frac{15}{2}$

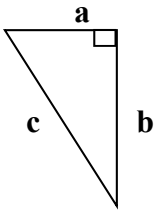
B. Find the solution(s) of the given systems of equations. Write answers in the form (x, y).

1. $-2x - 5y = 7$
   $7x + y = -8$
2. $4x + 9y = 2$
   $2x + 6y = 1$

V. Pythagorean Theorem and Trigonometric Ratios

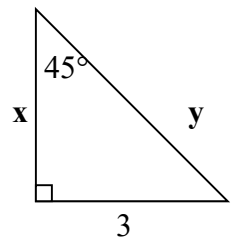
A. Solve for the missing side of the triangle using the Pythagorean Theorem:

1. a = 6 ft. b = 8 ft.
2. b = 17 ft. c = 19 ft.



B. Solve for x and y using a 45-45-90 (ratio of sides $1:1:\sqrt{2}$) **or a 30-60-90 triangle** (ratio of sides $1:\sqrt{3}:2$)**.**

1.



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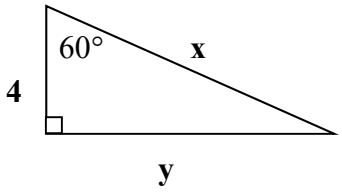

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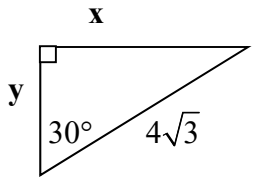
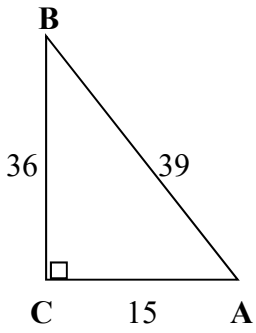


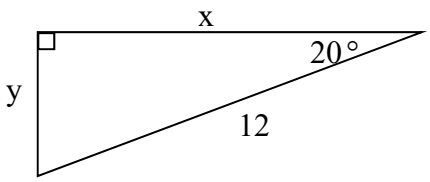
C. Given the right triangle, determine the trigonometric ratios.



1. sin A
2. cos A
3. tan A

D. Use trig ratios and a calculator to solve for x and y in each right triangle. Round answers to three places after the decimal point.

1.



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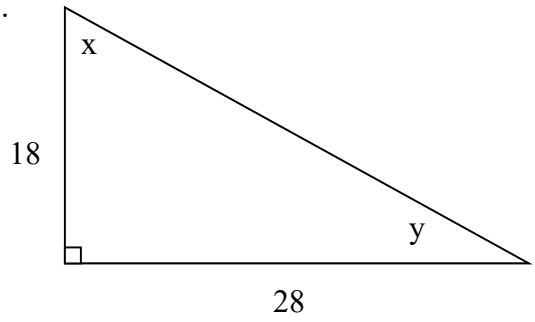

VI. Conic Sections

A. Write each equation in standard form. Then identify the type of conic figure represented by each equation.

1. $9x^2 + 25y^2 = 225$
2. $y^2 - 6y + 16x + 25 = 0$
3. $9x^2 - 2y^2 + 18 = 0$
4. $2x^2 + 2y^2 - 10x - 18y = 1$

B Write an equation in standard form for each of the following conic figures.

1. An ellipse with center at the origin, one vertex at (0, 5) and one focus at (0, 2).
2. A parabola with vertex (1,2) and directrix y = -2
3. A hyperbola with foci (0, - 5) and (0, 5) and difference of focal radii 8.
4. A circle with center (2, 3) passing through (- 3, 5)

C. Solve the system of equations. Write your solution(s) in the form (x, y)

1. $x + 3y = 5$
   $x^2 + y^2 = 25$
2. $y = x^2$
   $x^2 + y^2 = 20$