

# Paint Branch High School Pre-Calculus and Pre-Calculus with Analysis 2004 Summer Packet

Name \_\_\_\_\_

The problems in this packet are designed to help you review topics that are important to your success in pre calculus. All work should be shown for each problem. Use a separate sheet of paper, since there is not much room provided here. **The problems are due the first day of school.**

Additional copies of this review packet can also be printed from the Paint Branch High School website (in pdf) at: [www.mcps.k12.md.us/schools/paintbranchhs/](http://www.mcps.k12.md.us/schools/paintbranchhs/)

I. Polynomials and operations on real and imaginary numbers.

**A. Simplify these expressions**

1.  $\sqrt{-100}$

2.  $-\sqrt{-9}$

3.  $\sqrt{-4 \cdot -9}$

4.  $(i\sqrt{7})^2$

5.  $(5i\sqrt{11})^2$

6.  $\sqrt[3]{2x} \cdot \sqrt[3]{4x^2y^2} \cdot \sqrt[3]{y^4}$

7.  $(3 + 2i) + (5 + 7i)$

8.  $2i(3 - i)$

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

10.  $(3 + i\sqrt{5})^2$

11.  $\frac{8}{-2i}$

12.  $\frac{5i}{6 - 2i}$

**B. Factor completely**

1.  $6x^2 + 7x - 5$

2.  $t^2 - 4t - 21$

3.  $x^3 - 8$

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

**C. Simplify the following expressions**

1.  $5x^2 \cdot 2x^5$

2.  $(-2c^3)^2$

3.  $(x^m)^n \cdot (x^n)^{n-m}$

4.  $\frac{10 \cdot 2^6}{8 \cdot 2^{-2}}$

**D. Solve by completing the square or using the quadratic formula**

1.  $x^2 - 2x - 4 = 0$

2.  $2y^2 + 4y = -3$

**E. Graph the functions using a table of values, symmetry, rational root theorem, or other properties of polynomials to plot points. Verify the graph with your calculator. Describe the following characteristics for each function: a) domain and range b) real roots c) x- and y-intercepts d) end behavior e) intervals where increasing & decreasing**

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

2.  $f(x) = x^2 + 2x + 1$

3.  $f(x) = \sqrt{x-5}$

## II. Exponential and Logarithmic Functions and Operations

### A. Write in exponential form.

1.  $\log_5 25 = 2$

2.  $\log_{10}(.001) = -3$

3.  $\log_7 1 = 0$

4.  $\ln (1/e) = -1$

### B. Write in logarithmic form.

1.  $3^2 = 9$

2.  $10^{-2} = \frac{1}{100}$

3.  $2^1 = 2$

4.  $e^2 = 7.39$

### C. Evaluate. (Use a calculator for # 3 & # 4)

1.  $\log_7 49$

2.  $\log_5 \frac{1}{125}$

3.  $\log_3 120$

4.  $\log_8 50$

### D. Express as a log of a single number or expression (condense).

1.  $3\log_a 2$

2.  $\log_5 12 + \log_5 6$

3.  $\log_2 8 - \log_2 4$

### E. Solve.

1.  $\log_{16} x = -\frac{1}{2}$

2.  $\log_x 64 = 3$

3.  $\log_{10} (x + 6) + \log_{10} (x - 6) = 2$

### F. Solve. Leave # 1-2 in terms of "e" and leave #3 - 4 in terms of "ln".

1.  $\ln x = 3$

2.  $\ln x^3 = 12$

3.  $e^x = -2$

4.  $e^{2x} = 5$

### III. Function Operations

**A. Given:**  $f(x) = x^2 - 4$        $g(x) = \sqrt{2x+4}$

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. Find the inverse of  $f(x)$

### IV. Rational Expressions and Rational Functions

**A. Graph the following functions using a table of values and symmetry. Identify:**  
a) intercepts      b) asymptotes      c) even, odd, or neither

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

**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.  $\frac{x-2}{x} + \frac{x+4}{2x}$
5.  $\frac{4x}{x+6} + 2$
6.  $\frac{2x}{x-3} - \frac{x}{x+3}$

### V. Rewriting and Solving Equations

**A. Rewrite the equation in the indicated form.**

1.  $7y + 6x = 10$  in the form:  $y = mx + b$
2.  $\frac{1}{4}y - 7x = \frac{15}{2}$  in the form:  $Ax + By = C$

**B. Find the solutions of the given systems of equations using substitution.**

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

2.  $4x + 9y = 2$   
 $2x + 6y = 1$

**C. Find the solutions of the given systems of equations using linear combination.**

1.  $2x + y = 0$   
 $5x - 4y = 26$

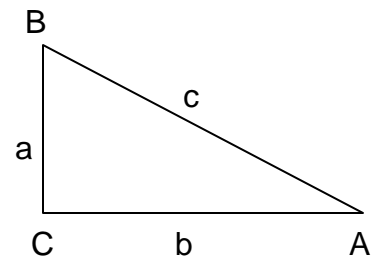
2.  $2 - 7x = 9y$   
 $2y - 4x = 6$

**VI. Pythagorean Theorem and Trigonometric Identities**

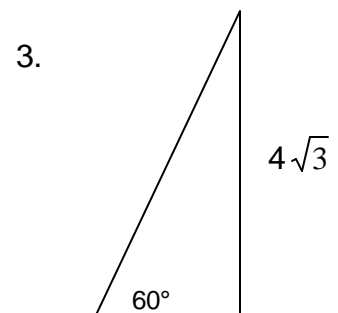
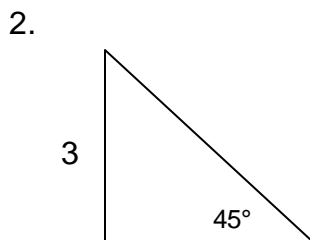
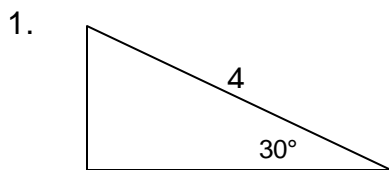
**A. Solve for the missing side of right  $\triangle ABC$  using the Pythagorean Theorem.**

1.  $a = 6$  ft,  $b = 8$  ft

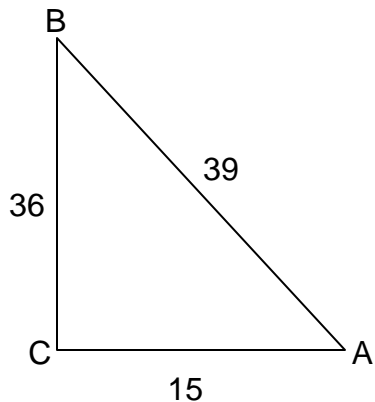
2.  $b = 17$  ft,  $c = 19$  ft



**B. Solve for the missing sides of the 45-45-90 and 30-60-90 triangles.**



**C. Given the right triangle, find the trigonometric ratios.**



$\sin A = \underline{\hspace{2cm}}$

$\sin B = \underline{\hspace{2cm}}$

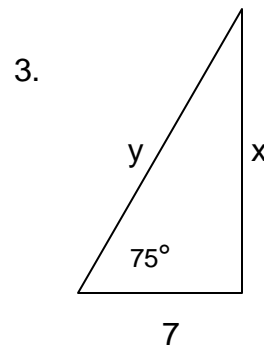
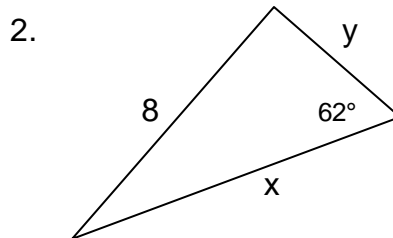
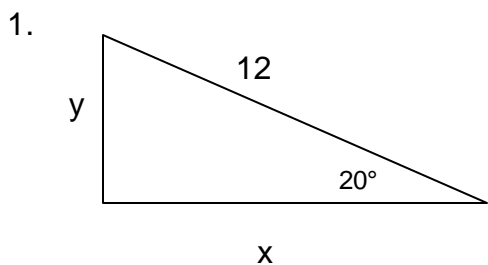
$\cos A = \underline{\hspace{2cm}}$

$\cos B = \underline{\hspace{2cm}}$

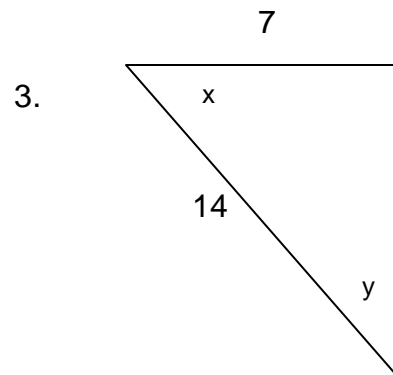
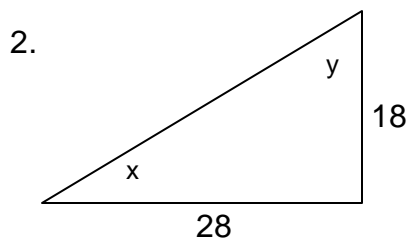
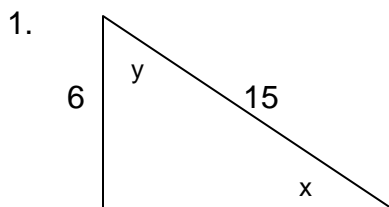
$\tan A = \underline{\hspace{2cm}}$

$\tan B = \underline{\hspace{2cm}}$

**D. Use trig ratios to solve for the missing sides x and y of each right triangle.**



**E. Use trig ratios to find the missing angles of each right triangle.**



VII. Conic Sections (for Pre Calculus with Analysis students)

**A. State the type of conic figure represented by each equation. Sketch the graph and indicate the vertices and foci.**

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 foci radii 8.

4. A circle with center (2,3) passing through (-3,5)