Pre Calc Prep!!!

Next year is right around the corner… and so is Pre-Calc! Many of the concepts you learned in Algebra II will be reinforced during Pre-Calculus. Please take some time this summer and work through this review packet. Refreshing your memory of the concepts learned in Algebra II will help you hit the ground running in Pre-Calc in the fall. Even though no one likes to do "homework" over summer vacation, putting in a little time up front will definitely help pay off next year. This packet may be collected next fall by your Pre-Calc teacher during the first week of school.

Have a great summer!!

Topics Covered in Algebra II that you need to know for Pre-Calc

- Solving Linear Equations
- Writing Equations of Lines
- Graphing Linear Equations
- Solving Quadratic Equations
- Fractions
- Factoring – MOST IMPORTANT FOR THE ENTIRE YEAR!
- Domain and Range
- Complex Numbers
- Trigonometry
- Logarithms
- Exponents
- Simplifying Radicals and Rational Expressions
- Graphing Lines
- Writing Equations of Lines

Plus more!!

Only some of these topics are covered in this packet. You will need to be ready for all of them in the fall though. Make sure you keep your Algebra 2 notes and use them to help you!

NAME_____

2018-2019 ALG 2 TEACHER (circle one) COX NIXON PAPPAS ROMAN VANSTON

Solving Linear Equations

In other words, solving for x… get the x alone by doing the same operation to both sides of the equation. Show all work!

1. $x + 3 = 23$
2. $19 = y - 5$
3. $24 = 3a$
4. $\frac{1}{3}k = -2$

5. $5x + 3 = 23$
6. $8 - 5w = -37$
7. $4x - 9 = 7x + 12$
8. $4(180 - x) = 90 - x$

Solve using cross-multiplication.

9. $\frac{5}{x} = \frac{7}{16}$ *(no decimals here)*
10. $\frac{a}{6} = \frac{-5}{2}$
11. $\frac{2x}{3} = \frac{x+1}{2}$
12. $\frac{k+3}{-5} = \frac{k-2}{3}$

Linear Functions

What is the equation for slope?_____ What is Slope-Intercept form? _____

What does m stand for?_____ b? _____

Write the equation of each line described.

1a. A horizontal line through the point $(2, 5)$.

2a. A vertical line through the point $(2, 5)$.

1b. What is the slope of this line?

2b. What is the slope of this line?

3. $m = 4$ and y-intercept = 3.

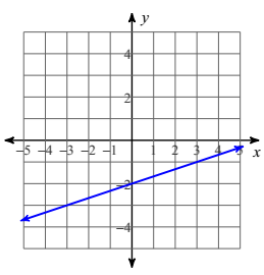
4. $m = -1$ and through the point $(1, -3)$

5. Find the slope between the points, then find the equation of the line.
$(6, 3)$ and $(-2, 4)$

6. Find the slope between the points, then find the equation of the line.
$(3, -2)$ and $(3, -5)$

Determine the equations of the following graphed lines.

1.



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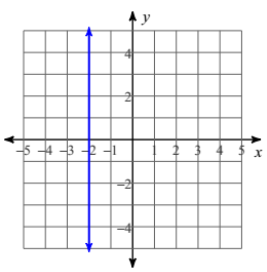

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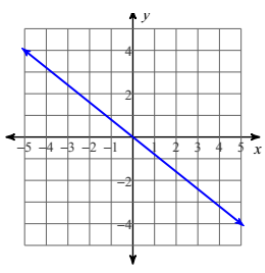

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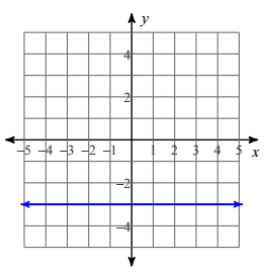
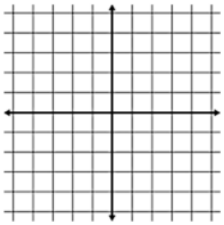
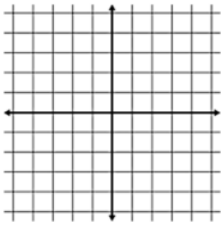


Graph the following equations of lines. Identify the slope and y-intercept.

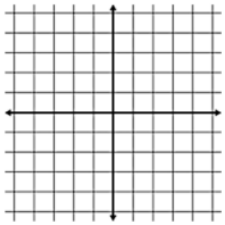
1. $y = -x + 5$ $m =$ _____ $b =$ _____



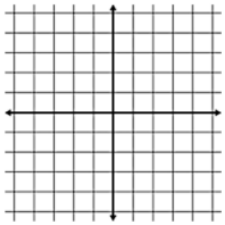
2. $2x + 3y = 12$ $m =$ _____ $b =$ _____



3. $y = \frac{2}{3}x - 5$ $m =$ _____ $b =$ _____



4. $y - 4 = 2(x - 1)$ $m =$ _____ $b =$ _____



Systems of Linear Equations

Solve the following by substitution or elimination. Remember your solution should be a (x, y) point!

1. $3x + 5y = 12$
   $x + 4y = 11$
2. $y = 2x - 2$
   $-5x + 4y = -2$
3. $7x + 20y = 11$
   $3x + 10y = 5$

MOST IMPORTANT FOR THE ENTIRE YEAR AND THE FIRST THING YOU WILL DO IN PC!

Factoring & FOIL

Before you factor, let's practice FOIL. FOIL is the opposite of factoring.

Use FOIL to multiply the following polynomials.

1. $(x + 2)(x - 3)$
2. $(x + 2)(x - 2)$
3. $(x + 2)^2$
4. $(2x - 3y)(-4x - 4y)$

Factor the following expressions using a common factor, difference of squares, perfect square trinomials or just plain factoring.

5. $3x^2 - 12x$
6. $6x^2 + x$
7. $2x + 8x^2$
8. $2x^3 + 8x^2 + 6x$
9. $x^2 - 36$
10. $x^4 - 81$
11. $4x^2 - 25$
12. $16x^2 - 225y^2$
13. $x^2 + 8x + 12$
14. $x^2 - 10x + 21$
15. $x^2 + x - 42$
16. $x^2 - 6x + 8$
17. $x^2 + 18x + 81$
18. $9x^2 - 12x + 4$
19. $25x^2 + 80x + 64$
20. $2x^2 + 5x + 2$
21. $3x^2 + 4x - 7$
22. $5x^2 - 11x + 2$
23. $6x^2 - 11x + 4$
24. $15x^2 - x - 2$

Fractions/Rational Expressions

Remember:
+/−: Must have common denominators; only add/subtract the numerators
×: Multiply across the top and across the bottom
÷: Multiply by the reciprocal of the second or bottom fraction
For Rational Expressions: you MUST factor first!!!!!!

Simplify the following fractions or rational expressions. Reduce when possible.

1. $\frac{1}{2}+\frac{5}{2}$
2. $\frac{2}{3}+\frac{3}{2}$
3. $\frac{2}{7}-\frac{3}{2}$
4. $\frac{1}{2}-\frac{8}{9}$
5. $\frac{1}{2}\cdot\frac{5}{2}$
6. $\frac{2}{3}\cdot\frac{3}{4}$
7. $\frac{1}{2}\div\frac{5}{2}$
8. $\frac{\frac{2}{5}}{\frac{7}{6}}$
9. $\frac{3}{x+1}+\frac{5}{x+1}$
10. $\frac{3}{x+1}-\frac{5}{x+1}$
11. $\frac{x+1}{x^2-1}$
12. $\frac{x^2+x-6}{x+3}$
13. $\frac{x^2+6x+8}{x^2+5x+4}$
14. $\frac{4x}{x^2-4}\cdot\frac{x+2}{16x}$
15. $\frac{x^2-x-12}{x^2-9}\cdot\frac{x+3}{x-4}$
16. $\frac{x-4}{x^2-4}\div\frac{x^2-3x-4}{x^2+5x+6}$

Simplifying Radicals

Simplify each radical… show EXACT answers only. NO DECIMALS! Work must be shown for credit!

1. $\sqrt{12}$
2. $\sqrt{200}$
3. $5\sqrt{90}$
4. $2\sqrt{12}$
5. $\sqrt{8}\cdot\sqrt{6}$
6. $2\sqrt{14}\cdot\sqrt{21}$
7. $\left(\sqrt{3}\right)^2$
8. $\left(2\sqrt{3}\right)^2$
9. $\sqrt{2}+5\sqrt{2}$
10. $\sqrt[3]{16}$
11. $\sqrt[3]{27}$
12. $\sqrt[4]{32}$

When dividing radicals, you are not allowed to have a radical in the **denominator** of a fraction.

Remember how to **rationalize** the denominator of a fraction.: $\frac{1}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}=\frac{\sqrt{3}}{3}$

Rationalize the denominator. Show all work and simplify answers completely!

17. $\frac{1}{\sqrt{2}}$
18. $\frac{3}{\sqrt{5}}$
19. $\frac{1}{1+\sqrt{2}}$
20. $\frac{2+\sqrt{2}}{1+\sqrt{2}}$
21. $\frac{\sqrt{2}-\sqrt{3}}{\sqrt{2}+\sqrt{3}}$
22. $\frac{\sqrt{5}+2\sqrt{2}}{5-3\sqrt{3}}$
23. $\frac{3}{\sqrt[3]{2}}$
24. $\frac{3}{\sqrt[3]{5}}$
25. $\frac{2}{\sqrt[3]{5^2}}$

Complex Numbers

Simplify the following complex expressions. Remember the powers of i. $i^1 = i, \quad i^2 = -1, \quad i^3 = -i, \quad i^4 = 1$

1. $i^7 + i^9$
2. $4i(1+i) + (6+2i)$
3. $(6+6i) - 3i^2(1-2i)$
4. $(1+2i)(3-i)$
5. $(1+2i)(1-2i)$
6. $(3+4i)^2$
7. $\frac{2}{3+i}$
8. $\frac{5-2i}{2+i}$

Solving Quadratic Equations

Solving a Quadratic Equation

Factoring

If $ab = 0$, then $a = 0$ or $b = 0$.

Example: $x^2 - x - 6 = 0$

$(x-3)(x+2) = 0$

$x - 3 = 0 \Rightarrow x = 3$

$x + 2 = 0 \Rightarrow x = -2$

Square Root Principle

If $u^2 = c$, where $c > 0$, then $u = \pm\sqrt{c}$.

Example: $(x+3)^2 = 16$

$x + 3 = \pm 4$

$x = -3 \pm 4$

$x = 1$ or $x = -7$

Completing the Square

If $x^2 + bx = c$, then

$x^2 + bx + \left(\frac{b}{2}\right)^2 = c + \left(\frac{b}{2}\right)^2$ Add $\left(\frac{b}{2}\right)^2$ to each side.

$\left(x + \frac{b}{2}\right)^2 = c + \frac{b^2}{4}$.

Example: $x^2 + 6x = 5$

$x^2 + 6x + 3^2 = 5 + 3^2$ Add $\left(\frac{6}{2}\right)^2$ to each side.

$(x+3)^2 = 14$

$x + 3 = \pm\sqrt{14}$

$x = -3 \pm \sqrt{14}$

Quadratic Formula

If $ax^2 + bx + c = 0$, then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Example: $2x^2 + 3x - 1 = 0$

$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(-1)}}{2(2)}$

$= \frac{-3 \pm \sqrt{17}}{4}$

These quadratic equations have already been factored. Solve them by setting each factor equal to zero.

1. $(x-3)(x+2) = 0$
2. $(2x+5)(3x-1) = 0$
3. $x(4x-3) = 0$
4. $7x(3x-2) = 0$

Solve each quadratic equation by factoring. ***Don't forget factoring can also mean a common factor.***

5. $2x^2 + 6x = 0$
6. $x^2 - 9 = 0$
7. $x^2 - x - 12 = 0$
8. $2x^2 + 3x - 2 = 0$
9. $x^2 + 2x - 15 = 0$
10. $x^2 + 6x + 9 = 0$
11. $4x^2 - 9 = 0$
12. $x^2 + 14x = -49$
13. $x^2 + 5x = 150$
14. $x^2 - 19x = 0$
15. $25x^2 = 1$
16. $3x^2 - 14x - 5 = 0$

Solve each quadratic equation by the Square Root Principle.

1. $x^2 = 16$
2. $(x+4)^2 = 6$
3. $(3x+7)^2 = 16$
4. $(x+5)^2 = -4$

Solve each quadratic equation by the Quadratic Formula.
Don't forget that your equation MUST be set = 0 before you can start plugging values into the quadratic formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1. $x^2 + 3x + 1 = 0$
2. $x^2 - 6x = -1$
3. $x^2 = -2x + 15$
4. $3 + 5x + 4x^2 = 0$

Solve each quadratic equation by Completing the Square.

1. $x^2 - 10x + 61 = 0$
2. $x^2 + 14x + 33 = 0$
3. $x^2 - 6x - 3 = 0$
4. $x^2 + 8 = 4x$

Exponents:

Remember the Exponent Rules!!!

1. $a^x \cdot a^y = a^{x+y}$ **2.** $\frac{a^x}{a^y} = a^{x-y}$ **3.** $(ab)^x = a^x b^x$ **4.** $\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$

5. $(a^x)^y = a^{xy}$ **6.** $a^0 = 1$ **7.** $a^{-x} = \frac{1}{a^x}$ **8.** $b^{\frac{p}{q}} = \sqrt[q]{b^p} = \left(\sqrt[q]{b}\right)^p$

Simplify the following. All answers should have POSITIVE exponents.

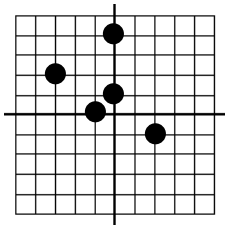
1. $x^6 \cdot x^4$
2. $2^3 \cdot 2^9$
3. $(x^3)^2$
4. $(4^3)^7$
5. $(2a^3c)^4$
6. $3(2a^2b^3c)^3$
7. $(2a^3x^2)^4(2ax^3)$
8. -5^2
9. $(-5)^2$
10. $\frac{x^6}{x^3}$
11. $\frac{16x^5y^6}{2x^3y^3}$
12. $\frac{(8x^2y)(2y^3)}{4xy}$
13. $\frac{m}{m^3}$
14. $3x^0$
15. x^{-3}
16. $\frac{1}{x^{-4}}$
17. $(5r^{-3}y^2)(2r^6s)$
18. $(a^3x^2)^{-4}$
19. $\left(\frac{2}{3}\right)^{-2}$ (fraction answer)
20. $(16)^{\frac{3}{2}}$
21. $\sqrt{8} \cdot \sqrt[6]{8}$
22. $2x^2(3x - 5x^5)$
23. $x^{n-1}(x^n + x^{2n+3})$

Domain and Range

Remember that domain refers to the x-values (independent variable) and range refers to the y-values (dependent variable). You can use listed numbers, inequalities, equations of lines, ARN (all real numbers), and ∅ as both domain and range value options.

State the domain and range of each graph.

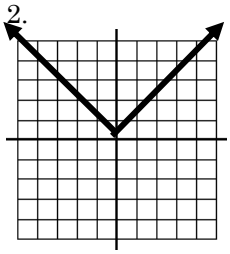
1.



Domain:

Range:

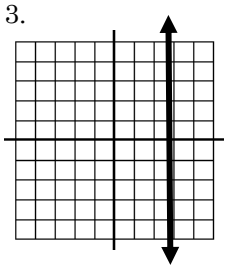
2.



Domain:

Range:

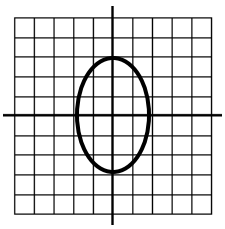
3.



Domain:

Range:

4.

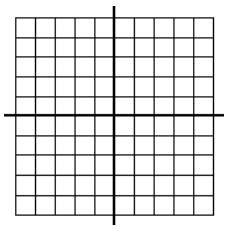


Domain:

Range:

It may be helpful to graph these equations.

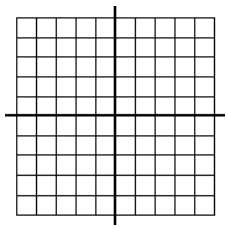
5. $y = 2x + 3$



Domain:

Range:

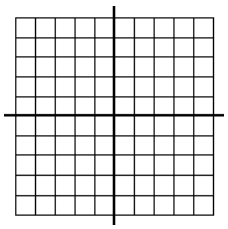
6. $y = \sqrt{x+2}$



Domain:

Range:

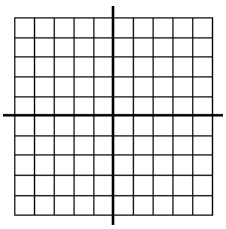
7. $y = \frac{1}{x}$



Domain:

Range:

8. $y = \frac{1}{\sqrt{x-3}}$



Domain:

Range:

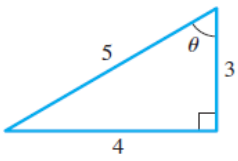
Right Triangle Trig:

Remember SOH CAH TOA, the reciprocal functions and the Pythagorean Theorem.

$\sin\theta = \frac{opp}{hyp}$ $\cos\theta = \frac{adj}{hyp}$ $\tan\theta = \frac{opp}{adj}$ $\csc\theta = \frac{hyp}{opp}$ $\sec\theta = \frac{hyp}{adj}$ $\cot\theta = \frac{adj}{opp}$ $a^2 + b^2 = c^2$

Find the exact value of the six trig rations in each triangle.

1.

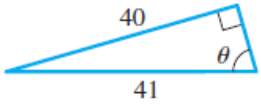


$\sin\theta =$ _____ $\cos\theta =$ _____

$\tan\theta =$ _____ $\csc\theta =$ _____

$\sec\theta =$ _____ $\cot\theta =$ _____

2.

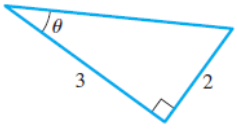


$\sin\theta =$ _____ $\cos\theta =$ _____

$\tan\theta =$ _____ $\csc\theta =$ _____

$\sec\theta =$ _____ $\cot\theta =$ _____

3.



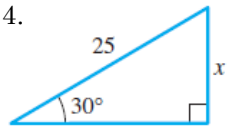
$\sin\theta =$ _____ $\cos\theta =$ _____

$\tan\theta =$ _____ $\csc\theta =$ _____

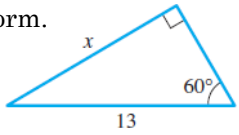
$\sec\theta =$ _____ $\cot\theta =$ _____

Use special right triangles or SOH CAH TOA to find the side labeled x.

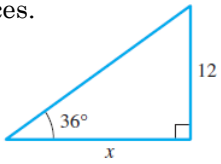
4.



5. Leave your answer in simplest radical form.



6. Round your answer to five decimal places.

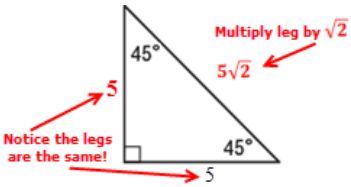


Special Right Triangles:

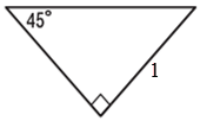
Find the lengths of both missing sides in each right triangle. 45°- 45°- 90°

THE RULE:

AN EXAMPLE:



1.



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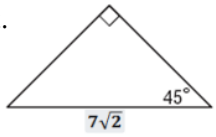

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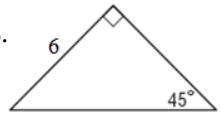

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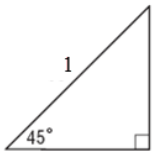
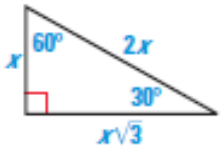
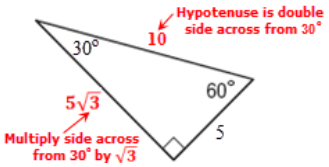


Find the lengths of both missing sides in each right triangle. 30°- 60°- 90°

THE RULE:

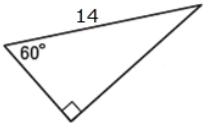


AN EXAMPLE:

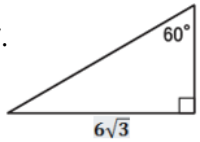


5.

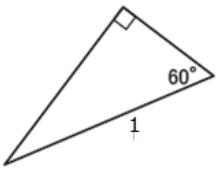
6.



7.



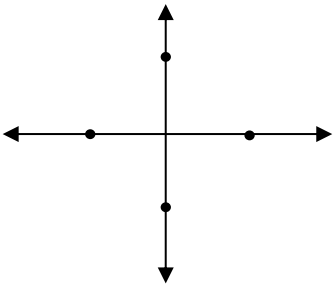
8.



Use both of **THE RULE** triangles from above to find the following values.

9. sin 30° = _____
10. sin 60° = _____
11. sin 45° = _____
12. cos 30° = _____
13. cos 60° = _____
14. cos 45° = _____
15. tan 30° = _____
16. tan 60° = _____
17. tan 45° = _____

Label the four quadrantal angles. Include the points and ∠ measures.



Use the points you just labeled to find the following.

18. sin 0°/360° = ____
19. sin 90° = ____
20. sin 180° = ____
21. sin 270° = ____
22. cos 0°/360° = ____
23. cos 90° = ____
24. cos 180° = ____
25. cos 270° = ____
26. tan 0°/360° = ____
27. tan 90° = ____
28. tan 180° = ____
29. tan 270° = ____