# Summer Assignment 2023 for Pre AP PreCalculus Students 

Dear Pre-Calculus Student:
Welcome to Precalculus, where you will expand on previous topics of Algebra II and Geometry such as trig, logarithms, and graphing. You will also be learning topics such as conics, imaginary numbers, and so much more. This course will challenge you mathematically and prepare you for Calculus.

As a student in Precalculus, you are expected to complete the summer math packet with work shown prior to the first day of fall semester of 2023. The packet can be found on the OCS website under High School > Documents and Forms > Summer 2023 Math Prep - Precalculus

Please know that you are responsible for bringing the completed packet(with work shown) to class.

You may use any of the additional resources that are provided below to supplement or relearn topics. You may ask clarification questions before a review test. Please make sure to read through every topic thoroughly and usethe recommended additional resources for extra practice.

Thank you so much, and I look forward to seeing you on the first day!

## Video Help:

- Krista King Math
- Khan academy
- YouTube


## Worksheets/practice problems:

www.ixl.com/math
www.kutasoftware.com

Directions: Please do all work on a separate sheet of paper. You may draw the graphs on the coordin ate planes that appear within this packet. It is strongly recommend that these problems be comp leted without the aid of a calculator, unless you are directed to use one. You will not be permitted to use a calculator on many of the Pre-Calculus assessments throughout the year, so this gives you an opportunity to sharpen your mental math skills. There will be an assessment on this material within the first five days of school. Good luck!

Write an equation in slope-intercept form for the line that satisfies each set of conditions.

1) slope 4 , passes through $(6,9)$
2) passes through (-8, -5) and (3,-10)
3) passes through $(-6,-6)$, parallel to $4 x-3 y=-24$
4) passes through $(4,2)$, perpendicular to $y=-2 x+3$

Find the $x$-intercept and the $y$-intercept of each equation.
5) $2 x-3 y+8=0$

Graph each linear equation.
7) $y=f x-3$

9) $J(x)=-1 / 2 x+5$

6) $J(x)=4 x-10$
8) $y=2$

10) $x+3 y=-6$


Graph each linear inequality.
11) $y>3 x+4$

12) $10-S y 2 x$


Solve each system by graphing. Describe it as consistent and independent, consistent and dependent, or inconsi stent.

| Type of System | The Graph | Solution |
| :---: | :---: | :---: |
| consistent and independent | intersecting lines | one solution, (x, y ) |
| consistent and dependent | coinciding lines | infinitely many solutions |
| inconsistent | parallel lines | no solution |

$$
\begin{aligned}
& x=3 \\
& \text { 13) }\{\quad y=-f x-1
\end{aligned}
$$


14) $\left\{\begin{array}{l}2 x+y=5 \\ 8 x+4=-4 y\end{array}\right.$


Solve each system algebraically (substitution or elimination) .
15) $\left\{\begin{array}{l}y+16=5 x \\ 2 x+3 y=3\end{array}\right.$
16) $\left\{\begin{array}{r}2 x-3 y=1 \\ 4 x-5 y=7\end{array}\right.$
$5 x-2 y=12$
17) $\{-\mathrm{fx}+\mathrm{f} \mathrm{y}=-3$

Solve the system of inequalities by graphing.
18) $\left\{\begin{array}{l}y<-3 x-1 \\ 3 x-6 y>6\end{array}\right.$


$$
\text { 19) } \begin{aligned}
& y:=: ; 3 / 4 \mathrm{x}+2 \\
& y 2 f x-3 \\
& x+y 22
\end{aligned}
$$



Simplify each expression using the laws of exponents. No negative exponents in your final answer.
20) $\left(-2 x^{3} y^{2}\right) 5$
2) $(36 T$

Simplify each expression.
24) $(3 m+4)(2 m-5)$
25) $(2 x+5 y) 2$
26) $(2 x+5)\left(4 x^{2}-10 x+25\right)$
27) $5 \mathrm{c}\left(2 \mathrm{c}^{2}-3 c+4\right)-2 \mathrm{c}(7 \mathrm{c}-8)$
28) $\begin{gathered}4 a^{3} b-6 a b+2 a b^{2} \\ 2 a b\end{gathered}$

Simplify each radical expression. No decimal approximations!
30) $-\sqrt{3} 36 x^{8} y^{2}$
31) $1 / 27 \mathrm{blsc}$
32) $\underline{\mathrm{v}} \mathrm{s} 1(\mathrm{x}+4)^{4}$
33) 75
34) 32
35) V40
36) $12 c^{6} d^{5}$
37) $\underline{v \operatorname{sx} 3 v 2} \cdot \underline{v 2 \times 5 v 2}$
38) 2 3-7,.fj+62
39) $48+3$,Jso
40) $\underline{\text { y } 3} 2$ :
41) $(1-3 X 1+3)$

Rationalize each denominator. (Use conjugates to rationalize binomial denominators.)
2
15
44) -- ${ }^{2}$
43)
5
5-1

9-2 3
45) $3+6$

Evaluate each expression involving rational exponents.
46) $49^{1 / 2}$
47) $125^{-1 / 3}$
48) $27^{2 / 3}$
49) $16^{5 / 4}$

Perform each operation if $f(x)=3 x-7$ and $g(x)=x^{2}+3$.
50) / (20)
51) $g(a-4)$
52) $g[f(-1)]$
53) $j^{\prime}[g(x)]$

Graph each quadratic function and complete the chart.

Reminder: The formula for the equation of the axis of symmetry is $x=-{ }_{b_{z}}$
54) $f(x)=x^{2}+2 x-3$

| opens up or down? |  |
| :---: | :--- |
| y-intercept |  |
| Axis of Symmetry |  |
| Vertex | $($ |
| Domain |  |
| Range |  |


55) $f(x)=-2 x^{2}+8 x-5$

| opens up or down? |  |
| :---: | :--- |
| y-intercept |  |
| Axis of Symmetry |  |
| Vertex | $($ |
| Domain |  |
| Range |  |



Mr. Goodman, who knows a lot about physics, is going to fire a rocket to start off this year's Battle of the Classes. He has done testing on the rocket to ensure it will not hit any students. If the rocket is laun ched upwards with an initial velocity of 200 feet per second, its height $h(t)$ (in feet) can be found by the function $h(t)=-16 t^{2}+120 /$, where $t$ is the numb er of seconds since it was launch ed.
56) How lon $g$ will it take for the rocket to reach its highest point?
57) What is the maximum height that the rocket will reach?

## Guidelines for Factoring:

- Always look for a GCF before doing anything else.
- Consider the number of terms in the polynomial.

Two Terms: Try factoring as a difference of two squares, or a sum or differenc e of two cubes.

$$
\begin{aligned}
& a^{2}-b^{2}=(a+b)(a-b) \\
& a^{3}-b^{3}=(a-b)\left(a^{2}+a b+b^{2}\right) \\
& a^{3}+b^{3}=(a+b)\left(a^{2}-a b+b^{2},\right.
\end{aligned}
$$

Three Terms: Trinomials of the form $a x^{2}+b x+c$ can be factored into the product of two binomials. (Use a method that your Algebra 2 teacher taught you.)

More Than Three Terms: Try "factoring by grouping" .

- Make sure the polynomial is factored completely. This means that each remaining factor is prime.

Factor each polynomial completely.
58) $8 a b^{2}-4 a b$
59) $x^{2}+4 x-21$
60) $25 x^{2}+10 x y+y^{2}$
61) $9 \mathrm{c}^{2}-49 d^{2}$
62) $3 x^{3}-3 x^{2}-90 x$
63) $3 x^{2}+28 x+32$
64) $x^{3}+5 x^{2}-2 x-10$
65) $6 x^{2}+7 x-3$
66) $\left[6 x^{3} y-8\right] x y$
67) $x^{4}-4 x^{2}-45$
68) $8 \mathrm{x}^{3}+125$
69) $18 \mathrm{a}^{2}-3 l a b+6 b^{2}$


The imaginary unit $i$ is defined as the principal square root of -I and can be written as $i=$. Since $i=$,it natur ally follows that $\left(1^{\prime}\right) 2=(\quad) 2 \quad i^{2}=-1$

Higher powers of $i$ can be found using the following method.

$$
\begin{aligned}
& 1=i \\
& i^{2}=-1 \\
& i^{3}=(i 2 X \cdot)=-1 \cdot \\
& \mathrm{r}^{4}=\left(; 2 X_{1} 2\right)=I
\end{aligned}
$$

Here are the first eight powers of $i$.

| $i^{\prime}$ | i | $i^{5}$ | $;$ |
| :--- | :--- | :--- | :--- |
| $i^{2}$ | -1 | $i^{6}$ | -1 |
| $i^{3}$ | $-i$ | $i^{7}$ | $-i$ |
| $i^{4}$ | I | $i^{8}$ | 1 |

A complex number is a numb er that can be writt en in $a+b i$ form.

## Simplify each expression.

70) $i^{14}$
71)     - J- 64
72) $=\underline{24}$
73) $(-3-i)-(4-S i)$
74) $(5+2 \mathrm{i}) 2$
75) $\begin{aligned} & 1+2 i \\ & 2-3 i\end{aligned}$

Solve each equation by factoring. Express your solutions in simplified radical form, if necessary.
76) $20 x^{2}-1 l x-3=0$
77) $2 x^{3}-12 x^{2}=-18 x$
78) $x^{4}=4-3 x^{2}$

Solve each equation by completing the square. Answer in simplified radical form, if necessary.
79) $x^{2}+10 x+41=0$
80) $\mathrm{x}^{2}+8 x+4=0$

Solve each equation by using the Quadratic Formula. Answer in simplified radical form, if necessary.
81) $2 x^{2}+6 x-3=0$
82) $\mathrm{x}^{2}+8=6 x-5$

$$
x=-\underline{b} \pm-\frac{b^{2}-4 a c}{2 a}
$$

Solve each quadratic equation using any method. Answer in simplified radical form, if necessary.
83) $(x+s)(x-3)=33$
84) $x^{2}-4 x+7=0$
85) Normal systolic blood pressure is a function of age. For a woman, the normal systolic blood pressure (in millimeters of mercury) is given by the function $P=.01 \mathrm{x}^{2}+.05 x+107$, where $x$ is the woman's age. Use this function to find the age of a woman whose systolic blood pressure is measured to be 121 millimeters of mercury. (Hint: Use the Quadratic Formula)


Simplify each expression.
$86 \underline{2 k 2-k-15}$
$k 2-13 k+30$
87) $-2 u^{3} y \quad 25 x^{3}$
$15 x z^{5} \quad 14 z / y^{2}$
88) $\begin{array}{r}\frac{2 x-14}{8 x} \\ \mathrm{x}^{2}-\underline{49}\end{array}$
91) $\frac{4}{3 x+6}-\frac{x+I}{x^{2}-4}$
92) $\frac{1+2^{\prime} \ddot{x}}{\frac{l_{\ddot{\prime}}}{l_{\dot{y}}+l_{\ddot{x}}}}$
90) $-\begin{array}{r}5 \\ x+3\end{array}+\begin{array}{r}2 \\ x+7\end{array}$
4 x
89)
$6 a b \quad 8 a^{2}$

Match each parent graph to its equation.
A) $J(x)=$
B) $J(x)=|X|$
C) $J(x)=$
D) $J(x)=x^{2}$
E) $f(x)=2^{x}$
F) $j(x)=\log _{2} x$
G) $J(x)=x^{3}$
H) $J(x)=[[x]]$
93)


95)

96)

97)

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