Waring School Summer Math Packet

for students entering Statistics / Intro to Calculus

Hi everyone!

This is a Problem Packet to review Algebra and Precalculus concepts to help you keep math ideas fresh over the summer. Use your brain and some resources to do these problems to the best of your ability. Your classroom teacher will collect your solutions during the first week of classes in September.

There are about 20 problems and 7 weeks of summer, so if you tackle about 3 problems a week, then you will be all done before pre-season!

We want to acknowledge that you all are coming off a challenging school year and trying to learn during the pandemic. Most people have lost class time over the past year, and we expect different people will be uncertain about different things. **So our message to you is - please just do your best!** And make note of ideas that feel unfamiliar to you. That will help us in the fall address any learning gaps you may have! We are all in this together - and we will figure it out together as well. We so appreciate your willingness to spend some time doing math this summer!

If you need a little extra help with procedures or the vocabulary you read here, I offer these online resources, all searchable by topic

http://www.coolmath.com/algebra (review of the basics)
https://www.coolmath.com/precalculus-review-calculus-intro (more recent material)
https://www.mathsisfun.com/algebra/index.html (great visuals for math vocabulary)
https://www.khanacademy.org/math/algebra2 (if you want video lessons)

Yes, everything in this packet is expected to be review. But you may also feel rusty when you are tackling these problems - and that's OK. Maintain your growth mindset. Chip away at these problems over the next few weeks. Take a break and come back. Check out the sites above. You got this!

If you have questions about specific problems, or anything else in this packet, you can look at our FAQ and Resources page, or E-mail our department chair Joan Sullivan at jsullivan@waringschool.org.

We hope you and your family have a good summer!
The Waring Math Teaching Team

Directions: (read carefully) All solutions should be written on separate sheets of paper. Make sure all solutions are numbered and easy to find. Important vocabulary has been written in **bold**. All problems in this packet should be solved algebraically without a calculator. You may need to leave an answer in logarithmic form such as x = ln 5, that's fine.

1. Let's open with a quick Algebra "correct the mistake" activity.

True or false. If false, change what is underlined to make the statement true.

a. $(x^3)^4 = x^{\underline{12}}$ T F

b. $x^{\frac{1}{2}}x^3 = x^{\underline{\frac{3}{2}}}$ T F

c. $(x+3)^2 = \underline{x^2+9}$ T F

d. $\frac{x^2-1}{x-1} = \underline{x}$ T F

e. $(4x+12)^2 = \underline{16}(x+3)^2$ T F

f. $\underline{3}+2\sqrt{x-3} = 5\sqrt{x-3}$ T F

2. Find the **x-intercept(s) and y-intercept** for each of the following:

a) $y = x - 1$
b) $y = x^2 + x - 1$
c) $y = (x-1)\sqrt{9-x^2}$
d) $y = \dfrac{x-3}{(3x+1)^2}$

3. Solve the following **systems of equations**:

a) $\begin{aligned} 2x - 3x &= 13 \\ 5x + 3y &= 1 \end{aligned}$

b) $\begin{aligned} y &= x^3 - 4x \\ y &= -x \end{aligned}$

4. Write the equation of the **linear function** with the following characteristics (you may use either **slope-intercept form** or **point-slope form**)

a) passes through (3, -4) and (5, 2)

b) **Vertical line** passing through (7.-8)

c) x intercept of 5 and y intercept of -3

d) **Perpendicular** to the line $3x + 4y = 7$ passing through the point $(-6, 4)$

5. Given the point in the coordinate plane, (3,5), place the digits 1-9 only once in the boxes to create a point $(\square\ ,\ \square)$, that **maximizes** the slope of the line that passes through the two points. The slope cannot be undefined. (Note: you will use two of the digits 1-9 in your answer).

6. SImplify the following **algebraic expressions** and rewrite without negative powers.

a) $\frac{2x^2y^{-3}}{x^3y}$

b) $-5\left(\frac{3}{2}\right)(4-9x)^{-1/2}(-9)$

c) $\frac{\frac{1}{2}(2x+5)^{-3/2}}{\frac{3}{2}}$

d) $\frac{1}{x^2} + 4x^{-2}$

e) $(2x+1)^2 - (3x^2+1)$

f) $\frac{(x^2-1)^{-2}}{(x-1)^{-3}}$

7. Factor the following algebraic expressions completely. Recall: "**Factor**" means to rewrite the expression as a product. If you are feeling rusty please check this resource: Factoring Toolkit

a) $x^2 - 4x - 5$

b) $16x^2 - 9$

c) $12x^4 + 6x^3 + 3x^2$

d) $3x^2 + 5x + 2$

(Hint: Strategy factor by grouping or AC method.)

e) $x \sin x - \sin x$

f) $2x^2 + 2x - 20$

8. State the **zeroes** of the following functions.

a) $x^2 - 4x - 5$

b) $\frac{x^2-2x}{x^2-4}$

9. Given the **functions** $f(x) = x^2 - 4x \quad and \quad g(x) = 5 - x$, find each of the following:

a) $f(g(x))$

b) $g(f(x))$

c) $f(x - 2)$

d) $g(2 - x)$

e) $g(-x)$

f) $\frac{1}{f(x)}$

10. State the **domain** and **range** of the following functions:

a) $f(x) = x^2$

b) $g(x) = \frac{x+2}{x^2-4}$

11. **Graph** each of the following by hand. Use an appropriate scale and mark the x-intercept, y-intercept, and other points you think are important.

a) $y = -3x + 2$

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

c) $y = e^x - 1$

d) $y = \frac{x}{x-3}$

12. State whether the expressions are **equivalent**. If they are not, re-write one or both so that they are equivalent.

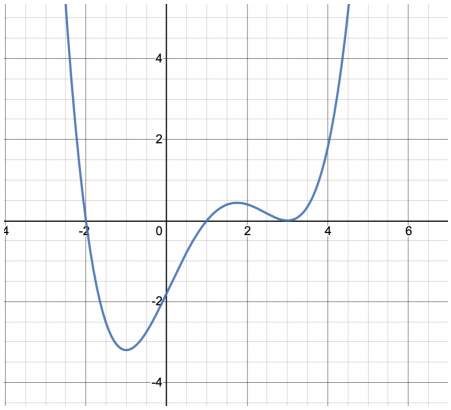
a) $2a + 3 \cdot (1 + 2)$ *and* $2a + 9$

b) $\frac{x^2+3x}{x^2-3x}$ and -1

13. Given the function, $f(x) = \frac{x^2-4}{x^2-4x^4}$, for what value(s) of x is… ?

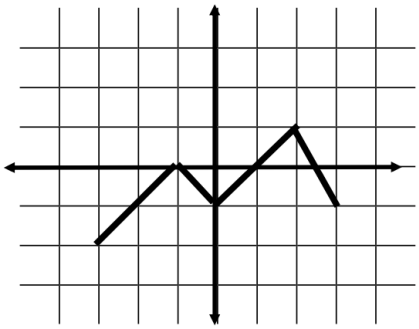
a) $f(x) = 0$ b) $f(x)$ **undefined**

14. This is the graph of a **polynomial function** $y = f(x)$. Identify its key features (if one does not exist, just write "none"):



Domain: _____ Range: _____
Degree: _____ Symmetry: _____
x-intercept(s): _____ Y-intercept: _____ Zeroes: _____ Multiplicity of each zero _____ Asymptote(s): _____

15. The graph of function, $f(x)$, is given. Graph each **transformation**.



a) $f(-x)$

b) $f(x+2)$

c) $-f(x)$

d) $f(x)+2$

16. Sketch $\frac{11\pi}{6}$ in a **Unit Circle** and state the value of trig functions sine, cosine, and tangent.

17. State the **amplitude, period, phase shift** and **vertical shift** for the sinusoidal function $y = \cos\left(x - \frac{\pi}{3}\right) + 1$. Then sketch one period of the function using an appropriate scale.

18. **Simplify** the expression: $(\tan x)(\cos x)(\sin x)$

19. **Solve** the following equations. Write your answers exactly, without decimal approximations. No Calculator necessary.

a) $\sin x = \frac{1}{2},\ for\, 0 \le x \le 2\pi$

b) $x^2 - 3x - 4 = 0$

c) $\log_3 81 = x$

d) $\log_3 \sqrt{3} = x$

e) $2^x = 1$

f) $25e^{-x} = 50$

g) $1 = \frac{2(x+13)}{10+x}$

h) $4 = \frac{x-1}{x}$

20. **Trigonometry**! Use the digits 1 through 9 to fill in the boxes and make THREE true number sentences. Use each digit at most one time each, so you will want to look for a set of six different digits for your answer.

$$\sin\left(\frac{\square\pi}{\square}\right) = 0$$

$$\sin\left(\frac{\square\pi}{\square}\right) = \frac{1}{2}$$

$$\sin\left(\frac{\square\pi}{\square}\right) = 1$$

This is the last page! Thanks for making it this far!! Don't forget to bring your work to class during the first week of classes!