Hello Future AP Calculus Student!

I'm so excited to work with you for the 2022 - 2023 school year! AP Calculus is a college level math class that will challenge your problem solving skills, build upon the prior math you've learned, and prepare you for future college classes. In order to cover the content before the AP test in May, we have a summer homework packet. Do not fear! **The packet is just review**! It is your guide to make sure you're comfortable with the material needed to be successful in AP Calculus.

Guidelines for AP Calculus Summer Homework

- This packet is <u>not a required assignment</u>, because you're doing it before the school year. However, I *highly* recommend completing it. This assignment will be your way to check to make sure AP Calc is truly a good fit for you. *Believe in yourself!*
- Helpful materials: old notes, khan academy, and a **graphing calculator** (you will need for class). If you do not have access to a graphing calculator, you can reach out to me or go to desmos.com/graphing to use a magical online graphing calculator.
- The best way to work on this packet is by doing a chunk of problems each week during summer. I know this homework may look overwhelming to start, but you're going to be so amazed at how much your brain knows! Just like working out muscles to train for a marathon or sport, this packet is training your brain for all of the amazing math we're going to do next year. Do a few problems each day, and before you know it you'll be done! *You can do it!*
- I will post step-by-step solutions on my website (go to Freedom's website, find the 'Staff' page, and then look for Reyburn). This is for you to use to check your work, not copy. I will also be available through email (<u>reyburns@luhsd.net</u>), remind (@apcreyburn), and my teacher instagram(@ms.reyburn).
- I advise you reach out to peers also taking this course, or me if you need questions answered. Form a study group! *Despite what you may think or have experienced in the past, the best mathematicians work with teams, not in isolation. Your classmates will show you ways to think through problems that you never would have discovered yourself. I'm sure you will do the same for them.*
- As with all work, your answers should be yours. *Photomath, your friend's answers, and Google might be able to help you now, but they won't on the AP test so let's make good choices.*
- Enjoy your summer! It's no fun to do math when you're stressed out. If you get stuck on some problems, check out the examples or wait to review with a friend or in class. *It's okay if you don't remember all of these topics right away, use this time to remind yourself that you can do this!*

I look forward to working with you all next school year!

Ms. Reyburn

Part 1: Calculus Readiness Quiz

We will have a 'readiness' quiz during the first two weeks of school on this material. The quiz will be a great indicator of whether or not you will feel prepared to take this course!

The practice problems below are similar to problems you could see on the quiz. The formatting is organized so if you need extra practice, you can find it on Khan Academy. Each section matches a section from the course called <u>'Getting Ready for AP Calculus'</u>.

Getting Ready for Limits and Continuity (Unit 1)

Functions



b. <i>h</i> (4)	d. <i>r</i> (0)
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2. Evaluate each of the following:

b. *p*(4)

3. Evaluate each of the following:

a. *r*(*h*(35))

c. q(h(x))

b. *f*(*g*(3))

Factoring

- 4. Factor each completely:
 - a. $x^2 11x + 30$ d. $16x^4 81$

b.
$$4x^2 + 8x - 32$$
 e. $3x^2 + 7x + 4$

c.
$$3x^3 + 2x^2 - 12x - 8$$

Trig

- 5. Evaluate the following: (you may need to use the unit circle on the last page)
 - a. $sin(\frac{\pi}{4})$ d. $sec(\frac{\pi}{2})$

b.
$$cos(\frac{4\pi}{3})$$
 e. $csc(\frac{7\pi}{4})$

- c. $tan(\pi)$ f. $cos(\pi)$
- 6. Simplify using trig identities so there is no fraction.

a.
$$\frac{1-\sin^2 x}{\cos x}$$
 c. $\frac{\cos x}{\sec x}$

b.
$$\frac{\sin x}{\cos x}$$
 d. $\frac{\sec^2 x - 1}{\sin x}$

Rational Expressions

7. Simplify the following. Make sure there are no radicals in the denominator.

a.
$$\frac{x}{x+3} + \frac{1}{x}$$

c. $\frac{\frac{1}{x}+1}{\frac{1}{x}-1}$

b.
$$\frac{x^2+3}{x^3} \div \frac{x+1}{x^4}$$
 d. $\frac{3}{\sqrt{x+1}}$

8. Simplify the following. Which x values make the original expression undefined?

<u>Getting Ready for Differentiation: Definition and Basic Rules (Unit 2)</u> Equations of Lines

- 9. Create a linear equation for the given information/representation:
 - a. Through the point (2, 1) with slope 4. b. Through points (4, 10) and (6, 10).

c. Through points (2, 7) and (4, 5)

e. For the graph below:



d. Through the point (5, 9) with an undefined slope.

Exponents and Logs

10. Simplify completely so there are no fractions:

a.
$$\frac{14}{2x}$$
 b. $\frac{2a^2 \cdot a^4}{a^5}$

11. Evaluate each logarithm without a calculator:

a.
$$\log_9 81$$
 c. $\log_2 \frac{1}{32}$

b. *log*₂₇3

<u>Getting Ready for Differentiation: Composite, Implicit, and Inverse Functions (Unit 3)</u> Literal Equations

12. Solve for y:

a.
$$x = \frac{2y}{y+3}$$
 b. $3x + 4y^2 = 19$

Inverse Functions

13. Find inverse of each of the following:

a.
$$g(x) = 2x + 1$$

b. $h(x) = \frac{x^3}{3}$

14. Given the following representations, find the indicated inverses:



Get ready for contextual applications of differentiation (Unit 4)

Word Problems and Modeling

15. Avis car rental charges a flat rental fee, plus an additional 10 cents per mile driven. When I rented a car with them, I drove 150 miles and paid \$330. Write a linear equation to represent the relationship between the amount of money you are charged (y) and how many miles you drive (x).

16. A kiddie pool has sprung a leak. Yikes. It starts with 7.5 gal of water. Five minutes after the leak began, there was 4.45 gallons left in the kiddie pool. Write a linear equation to represent the gallons left in the pool (y) and how much time has passed since the leak started (x).

17. Lennox owns a big apple orchard. She ships her apples to various markets using a fleet of trucks. Every week, each truck goes on 3 trips, and for each trip Lennox gets 300 dollars. On a single trip, a truck delivers 50 packs, and each pack contains 12 kilograms of apples. Overall, Lennox sells 4500 dollars worth of apples in a week. How many trucks does she have?

18. Jesse is filling spherical balloons. When full, one of these balloons has a diameter of 24cm. Jesse can fill a balloon at a rate of 820 cm³ per breath. How many breaths will it take for Jesse to fill a balloon?

19. Let G(t) represent the gallons of water in a pool t minutes after it began to drain. Interpret the following:

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a. G(3) = 100 c. G(20) > G(25)
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b. G(0) = 120

Get ready for applying derivatives to analyze functions (Unit 5)

Interpreting Features of a Graph

20.identify the following: maxima/minima, intervals of increasing/decreasing, zeroes (you can estimate to the nearest half)



Polynomials

21. Find zeros of each function:

a.
$$f(x) = x^3 + 11x^2 - x - 11$$
 b. $h(x) = x^4 - 6x^2$

22. Based on the zeroes you found above, determine on which intervals the function is positive and which intervals the function is negative. You may write your answer as inequalities or in interval notation.

a.
$$f(x) = x^{3} + 11x^{2} - x - 11$$
 b. $h(x) = x^{4} - 6x^{2}$

<u>Get ready for integration and accumulation of change (Unit 6)</u>

Basic Graphing

23. Sketch a graph of each function.

a.
$$g(x) = \sqrt{x}$$

b. $h(x) = -|x| + 3$
c. $f(x) = (x - 2)^2$
d. $p(x) = sin x$
e. $q(x) = cos x$
f. $r(x) = e^x$

<u>Get ready for applications of integration (Units 7 and 8)</u> Solving Equations

24. Solve.

a.
$$-7(3n + 8) + 1 = 36 - 8n$$

c. $4x^3 - 12x = 0$

b.
$$p^2 + 8p + 20 = 5$$

25. Solve. Be sure to check for extraneous solutions:

a.
$$\sqrt{-6 - n} = \sqrt{-16 - 2n}$$
 b. $\sqrt{34 - 3p} = p - 8$

c.
$$(n-2)^{3/4} - 7 = 20$$
 d. $\frac{-2}{x+3} = \frac{1}{x+1}$

26. Solve.

a.
$$12 = 4^x$$
 c. $124 = 3e^{2x}$

b.
$$4^{n-2} + 6 = 36$$

27. Solve each system.

a.
$$x + y = 13$$

 $2x - 4y = 14$
b. $x^{2} + y^{2} = 25$
 $y = x + 5$

28. Solve: (write your answer in radians, your answers should be on the interval 0 $\leq \theta \leq 2\pi$)

a.
$$-6\sin\theta = 3$$
 c. $\cos^2\theta = \cos\theta$

b. $2\cos\theta + \sqrt{3} = 0$

Part 2: Memorization (No memorization on the first quiz, but you need to start memorizing these in order to be successful in AP Calculus)

Trig Identities

$$\csc x = \frac{1}{\sin x}$$
 $\sec x = \frac{1}{\cos x}$ $\cot x = \frac{1}{\tan x}$ $\tan x = \frac{\sin x}{\cos x}$

 $sin^{2}x + cos^{2}x = 1$ $tan^{2}x + 1 = sec^{2}x$ $1 + cot^{2}x = csc^{2}x$

Double angle identities, half angle identities, sum and difference identities are less common but still helpful.

~ How to use the *<u>unit circle</u>* to find any trig ratio.

- ~ On the unit circle, points = $(\sin \theta, \cos \theta)$
- ~ Key trig values:

Sin, cos, and tan at 0, $\frac{\pi}{2}$, π , and $\frac{3\pi}{2}$

Exponents and Logarithms

$$\sqrt[n]{x^m} = x^{\frac{m}{n}}$$
 $x^{-1} = \frac{1}{x}$
 $y = \log_b x$ is equal to $x = b^y$



$$\log_b mn = \log_b m + \log_b n \mid \log_b \frac{m}{n} = \log_b m - \log_b n \mid \log_b m^n = n \log_b m$$

Other things to Consider

- ~Geometry formulas for area, surface area, and volume
- ~ Parent functions and properties (linear, exponential, quadratic, cubic, circles, conics, logs, e)
- ~ Slope/Rate of change and how to identify it in different representations