Name: _____

<u>Calculus Summer Preparation for 2019 2020 School Year</u>

The study of calculus requires a solid background in algebra, geometry, and trigonometry. Any weaknesses in your background will surface and make learning calculus much more difficult. So, spend some time this summer preparing. The time spent will help ease your transition into college level mathematics. You should go online at www.khanacademy.org or on youtube.com and watch videos that cover **Basic Trigonometry, Trig Identities, Logarithms, Exponential Expressions and Equations, Exponential and Log Functions, and Functions and their graphs**. A general refresh over all concepts covered from Algebra 1 through Pre-Calculus is encouraged. Think of it this way. Any concept that you aren't strong in coming into class, will need to be relearned while at the same time learning new calculus techniques. Do not make life difficult on yourself.

We will be using TI-Nspire calculators in class and we recommend purchasing one for use at home if you haven't already bought one. If you buy one, spend a few dollars more money and get the TI-Nspire CX CAS version. An additional recommended resource is buying the Barron's AP Calculus textbook (amazon and bookstores will have). Read the introduction, read the functions unit and work the functions unit multiple-choice test.

The concepts and preparation described in this document should NOT be done three days before the school year starts. It also should NOT be done in June and then set aside in your backpack for three months. Work through it and reflect. Use this and other resources at several/many points throughout the summer. Come into the school year ready to hit the ground running.

<u>Pre-calculus Checklist:</u>
This list is NOT all encompassing but should be a good base of reference for you.

- Know the parent function graphs listed below and their domain and range.
- Graph an equation by hand and using a graphing calculator.

Linear	Rational	Sine and $\sin^{-1}$	Secant and $\sec^{-1}$
Quadratic	Absolute Value	Cosine and $\cos^{-1}$	Cotangent and $\cot^{-1}$
Cubic	Exponential	Tangent and $\tan^{-1}$	Cosecant and $\csc^{-1}$
Square Root	Common Log	Natural Log	Integer Function

- Given a graph, be able to identify what family of functions it is contained in. Identify key features of the graph and be able to state features about it.

- Solve equations in various forms by hand and calculator.

- Use Exponential and Logarithmic rules to simplify expressions. Use various laws of exponents in a variety of ways.

- Have strong familiarity and ease with rational functions and their graphs.

- Evaluate by hand and calculator trigonometric and trigonometric inverses by hand.(Complete the attached chart and/or unit circle in less than ten minutes.). This was the largest weakness that we have seen from incoming students in recent years.

- Completing the square with $a \neq 1$

- Be able to factor/solve given many different forms! Quadratic, GCF, quadratic formula, difference of squares, factor by grouping, completing the square, etc.

- Refresh on all trig identities. In addition, here are some to learn this summer in addition to what you are carrying over from Pre Calc:

  Double Angle Formulas to know:

$$\sin(2x) = 2\sin x \cos x$$

$$\sin^2 x = \frac{1 - \cos(2x)}{2}$$

$$\cos^2 x = \frac{1 + \cos(2x)}{2}$$

Making jump from Regular Pre-Calc to AP Calc? Reference the Larson PreCalc book you have now. Make copies as needed, etc. Areas you missed to cover now:
1. Chapter 6.3-6.4 Vectors. Do a heavy skim on these and take a few notes. Not a heavy emphasis on this in AP Calc but need to have basic understanding.
2. Chapters 9.1-9.2 Circles, Ellipses, etc. Do a deeper dive on this. Read both sections in full. Try out some homework problems and ask questions. You will need a good idea of these for AP Calc.
3. Chapter 7.1-7.3 Systems. You should recognize these from past years. But we do build into three systems. You will see these next year. Review this one hard as well.

Take the self-check on the next pages to determine areas which you need to study. There will be a quiz over the prerequisites for calculus in the first week of school.

Self-Check:

By hand find the following:

$$\sin\left(\frac{\pi}{3}\right) = \qquad \cos\left(\frac{4\pi}{3}\right) = \qquad \tan\left(\frac{\pi}{2}\right) = \qquad \cos\left(\frac{3\pi}{2}\right) = \qquad \sin\left(\frac{7\pi}{4}\right) =$$

$$\sin^{-1}\left(-\frac{1}{2}\right) = \qquad \cos^{-1}(-1) = \qquad \tan^{-1}(1) = \qquad \sec^{-1}(2) =$$

State the domain and rage of the following functions without using a calculator:

$$y = \sin(x) \qquad\qquad y = \tan^{-1}(x) \qquad\qquad y = 2^x \qquad\qquad y = \log_2 x =$$

Write the following using $\sin(x)$ and $\cos(x)$:

$$\sin(2x) = \qquad\qquad\qquad\qquad \cos(2x) =$$

Complete the Pythagorean Identities:

$$\sin^2(x) = \qquad\qquad \cos^2(x) = \qquad\qquad \tan^2(x) = \qquad\qquad \sec^2(x) =$$

Simplify using trig identities:

$$\sqrt{9 + 9\tan^2 x} = \qquad\qquad\qquad \frac{1}{\sqrt{\frac{4}{25} - \frac{4}{25}\sin^2 x}}$$

Write the following as a single logarithm by hand:

$$5\log_2 x + 2\log_2(x+1) = \qquad\qquad 2\log_2 x^2 - \log_2(x-2) =$$

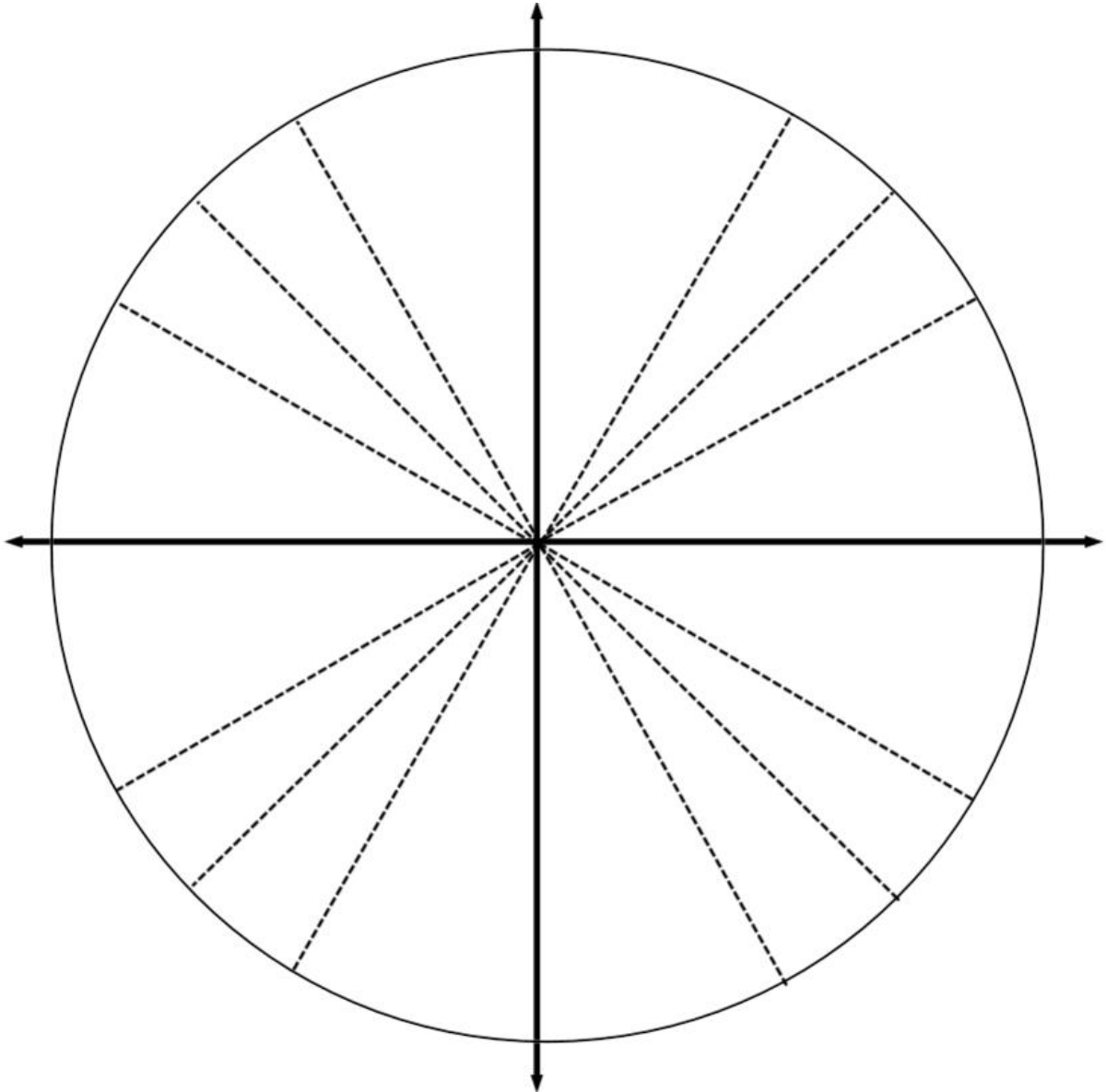Write the following as a sum or difference of single logarithms

$$3\log(xy^2) = \qquad\qquad \log\left(\frac{x^2}{x-3}\right) = \qquad\qquad \log_7 x^5 =$$

Complete the square:

$$4x^2 + 16x + 8 \qquad\qquad x^2 + 6x - 2 \qquad\qquad 3x^2 + x - 5$$

Complete the diagram. Include the following:
- a. The point (x, y) on the unit circle
- b. The angle in Degrees
- c. The angle in Radians

Trig Chart (complete by hand in under 10 minutes)

Degrees	Radians	$\sin(x)$	$\cos(x)$	$\tan(x)$	$\csc(x)$	$\sec(x)$	$\cot(x)$
0							
30							
45							
60							
90							
120							
135							
150							
180							
210							
225							
240							
270							
300							
315							
330							
360							