**Unit 1: Operations with Polynomials**

- Self-explanatory
- Addition, subtraction, multiplication, and division

**Unit 2: Factoring:**

- Remember to take the GCF
- FAM - make sure you correctly find the terms that add and multiply together
- Be careful with the signs

**Unit 3: Radicals and Exponents**

- Check for extraneous solutions
- Negative exponents = flip!
- When solving fractional exponent equations, look out for evens and odds to dictate whether or not you need the plus or minus sign for the solution.
- Power/root
- No number in front of radical = 1
- Careful with distribution when rationalizing
    - Conjugate rule: $(a - \sqrt{b})(a + \sqrt{b}) \rightarrow a^2 - b$
- If the radicands are NOT the same, you may need to simplify in order to get them to be the same.
- Different indexes cannot be together
- Same indexes…
    - Added and subtracted: Coefficients combine
    - Multiplied and divided: Radicands as well

**Unit 4: Complex Numbers**

- Careful with the i's…
    - $i^o = 1$
    - $i^1 = i$
    - $i^2 = -1$
    - $i^3 = -i$
    - $i^4 = 1$
    -
- You can never multiply what is within the radical… you must simplify further first.

**Unit 5: Quadratics**

- Whenever you square something, it's always going to be plus or minus.

- Beware that you may need to find the missing root (use sum or product formulas!)
    - Product: -b/a
    - Sum: c/a

**Unit 6: Conic Sections**

- The p-value represents how many units are between the vertex/focus and vertex/directrix.
    - 1/4p
- Vertex is the midpoint between focus (inside) and directrix (line; outside).
- Positive p-value = parabola opening upwards (negative is opposite)
- Vertex form: $y = a(x-h)^2 + k$
- Parabola equation: $y = 1/4p(x-h)^2 + k$
- Sometimes the h and k values are opposite of what's in the equation

**Unit 7: Systems of Equations**

- How to find the vertex:
    - Use **-b/2a** for the quadratic equation
    - After you get an x-value, plug it into the quadratic equation to get the y-value
- Pattern for graphing quadratics: 1, 3, 5, 7, 9 (odd numbers after finding vertex)
- Don't forget to multiply the number to the other side of the equation during elimination method
- When dealing with 3x3 systems, you're always trying to eliminate ONE variable.
    - During this process, number the equations to make your life easier
- Completing the square is used to get to vertex or circle form.
    - Make sure you distribute the GCF if there is one.
- Graphing:
    - Label the different functions (if applicable)
    - P-value must be labeled - as well as all other components of the graph.
    - Beware of intervals… no arrows if there are!
- CAREFUL WITH THE SIGNS.

**Unit 8: Rationalizing Expressions and Equations**

- Always reject the number that will make the expression undefined.
- Be careful with factoring and the additive inverses.
- You can multiply stuff by different numbers, but they just need to get to the LCD.

- You can cross multiply to cancel in every possible way/direction, but just not horizontally across.
- Extraneous Solutions = solutions that need to be rejected
- Empty solution set = { }
- Remember how to make your own equations…
    - $1/a + 1/b = 1/t$

**Unit 9: Functions**

- When finding the inverses, you just replace the x with y and isolate y to find the inverse equation.
- One to one functions: Passes vertical and horizontal line tests which indicates that the graph and its inverse are functions.

**Unit 10: Polynomials**

- READ EVERYTHING CAREFULLY
    - No arrows when there are intervals
    - Label the function accordingly (ex. do not put f(x) when it says p(x))
- If something is a factor of a polynomial function, then it's also a zero (x-intercept) of the function.
    - When you put in the zeros in the function, the y-value is going to be 0.
- Remember the end behaviors…
    - Negative coefficient and even degree = Both ends pointing down
    - Negative coefficient and odd degree = Left end pointing up and right end pointing down
    - Positive coefficient and even degree = Both ends pointing up
    - Positive coefficient and odd degree = Left end pointing down and right end pointing up
- Sum of multiplicities/degree = number of roots
- Remainder and Factor Theorems are NOT the same thing
- When using synthetic division
    - The magic number is the value of x in the divisor
    - Everything needs to be in standard form (use place holders if needed)
    - One less degree when writing the quotient
- Depressed Polynomial Function = quotient
- EVERYTHING NEEDS to BE IN STANDARD FORM

**Unit 11: Introduction to Exponentials**

- Vertical and horizontal stretches/shrinks are the opposite of each other

- f(-x) = reflection over the y-axis
- -f(x) = reflection over the x-axis
- Again, do not put arrows if there are intervals.
- Asymptote = Line that exponential function will never touch, but continuously approach
- PUT DASHES FOR ASYMPTOTE
- Opposite signs within ( )
- When finding the ARoC, the ARoC ONLY APPLIES TO THE INTERVAL in which you found the rate of change.
    - Ex. Between 50 and 70 mph, the ARoC was +7.5 ft/mph, but this doesn't apply from 10 to 20 mph.

## Unit 12: Logarithms and Exponential Function Word Problems

**LOGARITHMS:**

- Logs are the inverses of exponential functions
    - $y=2^x \rightarrow y = \log_2 x$
- $y = \log_b x$
    - y (x-value) = end value
    - b (base) = base
    - x (y-value) = argument

*Things inside of ( ) is the equivalent of parts of exponents.

- Anything that says "continuous" needs the variable "e"
- Growth/Decay Factor: 1+r/1-r
- e = 2.718…
- "e" is considered the base of ln
- You never get rid of the "log" or "ln" when you're expanding
- lne = 1 and ln1 = 0
- Make sure you're rounding to the right place (based on the instructions)
- Just convert log form to exponential form to solve for log equations
- Common base for solving exponential equations (to then set the exponents equal to each other) or convert to log form!
- When you're solving for logs, you can just set the arguments equal to each other ONLY IF the bases of the functions are equal.
- You usually won't need to reject solutions… unless it makes the argument negative.

**EXPONENTIAL/LOG WORD PROBLEMS:**

- Always follow the instructions and round to the correct place

    - Always follow directions first
    - During a year = round down
    - After a year = round up
- If the word problem says, "continuously," then you need to use the "e"
- r = rate in decimal form
    - This is before you add or subtract the rate from 1
    - Rate does not equal to the growth/decay factors
- "n" in the compound interest represents the number of times you get compounded annually so…
    - Yearly = 1
    - Monthly = 12
    - Quarterly = 4
- The "k" value is considered the rate in Newton's Cooling Equation and it's always negative (because it's cooling)

**Unit 13: Sequences and Series**

- Two sequences are arithmetic and geometric while two types of formulas are explicit and recursive
- Read carefully…
    - Initial amount can be at 0 time or 1 time
    - Total amount of something = the sum
- Don't get your formulas mixed up
    - Arithmetic:
        - $a_n = a_1 + (n-1)(d)$
            - d = common difference
        - $a_1 = \#$, $a_n = a_{n-1} +/- d$
        - $S_n = n(a_1+a_n/2)$
    - Geometric:
        - $a_n = a_n r^{n-1}$
        - $a_1 = \#$, $a_n = a_{n-1} r$
        - $S_n = (a_1 - a_1 r^n)/1-r$
- The backwards E is also for finding the sums where the top number is the ending value, the bottom number is initial value, and the expression in ( ) is the explicit form of the sequence
- DO NOT FORGET TO WRITe INITIAL VALUE FOR RECURSIVE FORMULAS
- Round to the right places

**Unit 14: Trigonometry Functions**

- Whenever you're reversing the graph because of a negative, you are NOT reversing the acronym (All Students Take Calculus).
- Write radians for the unit of measurement when applied.
- Be careful with the signs…
    - ASTC
- Reciprocals are flipped, but have the same signs
- Steps for using triangles to find exact trig values…
    - Draw the reference triangle
    - Label with the information you have
    - Find missing side of triangle
    - Use SOHCAHTOA to determine the sides
- Another way to find the exact trig values…
    - QRS (Quadrant - Reference Triangle - Sign)
- REMEMBER THE TRIG CHART
- Whenever you're finding the exact trig value and there is an exponent of two (square), you must double your end value.
- $\sin^2\Theta + \cos^2\Theta = 1$
    - If you can remember this pythagorean theorem, you're set
- Whenever simplifying pythagorean equations, just find ways to get it equal to 1 or cross multiply after expressing a trig value in its expanded version (ex. Tangent = sine/cosine)

**Unit 15: Trig Graphs**

- NEVER FORGET THE NEGATIVE AND POSITIVE SIGNS
    - Determined by using ASTC
    - This factors into your answer
- Pay attention to if the question is asking for degrees of radians
- Amplitude is associated with differences while midline is associated with average
- Remember the tricks with 0, -1, 1, and negative/positive infinite with the graphs.
- When you take the square root of something, you need to have plus and minus (doubles your answers too).
- When functions are positive…
    - Goes upward from the midline in sine functions
    - STARTS at the maximum for cosine functions
- When functions are negative…
    - Goes downward from the midline in sine functions
    - STARTS at the minimum for cosine functions

- 2pi/B can be used to find the period, which can then be divided by 4 to find the different intervals
- 2pi/period can be used to find the frequency

**Unit 16: Probability**

- Make sure you're reading the two-way charts correctly
- Remember all of the formulas
- If two events are mutually exclusive, there is a probability of 0 for the two events to happen at the same time
    - Independent probabilities DO NOT make them mutually exclusive!
- In venn diagrams, the number outside is representative of those who didn't come across either event
- When the probabilities are equal, they are independent - if not, they are dependent
- You could just multiply two different probabilities to find the likelihood of both events occurring (so long as they are independent of each other… do not overthink).
    - P(A and B) = P(A) x P(B)

**Unit 17: Statistics**

- MAKE SURE YOU CLICK OFF LOG MODE IN CALC
- If $p > 0.05$ →INSIGNIFICANT, usual, not effective
- If $p < 0.05$ → SIGNIFICANT, unusual, effective
- Remember the complex margin of error formula…
    - MoE = 2(rad(P(1-P)/n))
- Always divert to the confidence interval (95%) when trying to see if it's significant or not.
    - If not, you can use the p-value.
- Smaller sample size → larger margin of error → greater confidence interval → less accurate
- Larger sample size → Smaller margin of error → smaller confidence interval → more accurate
- Best sample is random
- Theta looking symbol is the POPULATION sample while the S is the SAMPLE for standard deviation.
- Standard deviation = how dispersed the data is from the mean
    - 1 SD = 68%
    - 2 SD = 95%
    - 3 SD = 99.7%

- Mean = average
- Differences of the means: Group 1 - Group 2 (even if negative)
    - This is when you usually have to use the “p” value (the number you use will be the difference between the means to find whether or not they are statistically significant)