

Chapter 1 Review List

I. The Bare Necessities:

A. The definitions

- BLOB1 is proportional to BLOB2
- Algebraic: A function is linear when...
- Algebraic: A function is exponential when ...
- Algebraic: A function is a power function when ...
- Algebraic: A function is logarithmic when...
- Algebraic: How to evaluate $\log_b(x)$ for any log function using the exponential function $y = b^x$
- How to find $\sin(t)$, $\cos(t)$, $\tan(t)$ on the unit circle for any values of t , both precisely (with the unit circle and your calculator) and rough-and-dirty (with unit circle, but without calculator)
- How to find $\arcsin(y)$, $\arccos(x)$, $\arctan(\frac{y}{x})$ for any values of $y, x, \frac{y}{x}$ (rough-and-dirty and not necessarily exact)
- How to find function values and graph of any piecewise-defined function.

B. From the data and graphs: Be able to determine if the function is

- linear (differences constant? graph 'straight'?)
- exponential (ratios constant? one horizontal asymptote?)
- quadratic (second differences constant? look like parabola?)
- cubic (third differences constant? look like sideways 'S'?)
- logarithmic (If you switch the x and y , is it exponential? One vertical asymptote, with whole side missing?)
- trig (is it periodic? is the graph periodic?)
- inverse trig (If you switch the x and y , is it trig?)
- power (if you take $u = \ln(x)$ and $v = \ln(y)$, is it linear?)

and be able to find sample equations for them. **Note:** Very often it is better to start by graphing the data, even if it's given numerically

C. Rough-and-Dirty Graphing Skills:

- Be able to give rough sketches for any of the above types of functions without your calculator, *quickly*
- Be able to make horizontal and vertical shifts, horizontal and vertical stretches and contractions, without necessarily having the equations...

D. Algebraic skills: Be able to solve:

- linear equations
- quadratic equations (quadratic formula included)
- polynomial equations, if factorable
- exponential equations, by using logs and rules of logs
- log equations, by getting rid of the logs

- trig equations, by using the unit circle. This includes finding *all* solutions
- power equations (like $3x^{5/3} = 17$, for example)

E. Calculator Skills:

- Graph any function correctly, including piecewise-defined functions
- Solve equations graphically, including knowing you have all the solutions
- Graph any set of points
- Make a table of data for any function
- Be able to change the graphing window to meet needs
- Be able to go back and forth between function and parametric modes

F. Limits:

- Be able to approximate the values of limits from graphs or tables, and be able to evaluate the exact values of limits algebraically, with the following procedure:
 - Plug-in (when the function is continuous!)
 - Try to rewrite/simplify, then plug-in. This may involve
 - Multiplying out expressions
 - Simplifying complicated fractions (by multiplying the top and bottom by a suitable common denominator)
 - Rationalizing a denominator or numerator by multiplying by the conjugate
 - if the limit is one where $x \rightarrow \infty$, try dividing the top and bottom by the same power of x , and then try the next step!
 - If none of the above works, try comparing the size of the numerator to the denominator, or with more detail, seeing how big all of the parts of the expression are getting, then try to draw a conclusion
- You should also be prepared to show when a specific limit doesn't exist by showing the left-hand limit does not equal the right-hand limit

G. Beyond the skills: If you're stuck, try making a table, or drawing a graph to get started

- From a narrative, sketch a corresponding graph, *well enough to recognize the function type*
- Exponential function problems
 - Given data points, even in narrative, find equation of exponential function, (CAREFUL: Note the difference between continuous growth rate, and growth rates that are not continuous, like monthly, hourly, annually, etc.)
 - Find continuous growth rate given not-continuous growth rate, and vice versa
 - Be able to convert functions like P_0a^{blob} to $Q_0e^{different\ blob}$ and vice versa
- Power functions:
 - Which power functions are bigger where?
 - Which dominates, exponential or power? logarithmic or power?
- New functions from old: Be able to make formulas and data and graphs of new functions from data and graphs and formulas of old functions

- Trig functions: Beyond the rough and dirty:
 - i. Period = how long it takes this function to repeat
 - ii. Finding equations of trig functions and using them from graphs
- Polynomial functions: Be able to find equations from graphs, and be able to tell the difference between poly and trig

H. Test-taking strategies:

- The number of points each problem will be worth will be listed; find problems that you can do easily first (that aren't worth 0 points!)
- Don't sit and stare at a problem for too long. If you're stuck for more than 5 minutes on a single problem, you need to go to a different problem and come back later
- If you're stuck on a problem, and have already done your 'unstuck' problems, try making a table to see a pattern. *Remember:* If you're trying to see a pattern, don't simplify any of the numbers using arithmetic!