GC (Apple) for Calculus 1

	HOW TO…	KEYS TO PRESS
GRAPHING	Draw graph	Type *y*= equation, then **press Enter**
	Display a dot at the point (x, y)	Ctrl-2 & fill in $\begin{bmatrix} x \\ y \end{bmatrix}$
	Graph with function notation	Two lines. Example: $f(t) = 3t - 4$ (define the function using Ctrl-9) $y = f(x)$ (assign independent values to x and dependent values f(x) to y)
	View two graphs side by side	Use *y* and *x* on one line, and *y'* and *x'* on the other
	Graph in polar coordinates	Above instructions, but use *r* and θ instead of *x* and *y*
GRAPH VIEW	Change color or make invisible	Click & hold on colored box, choose color or ☒ for invisible
	Zoom in or out	in lower left corner
	Zoom in or out only on x-axis or y-axis	Option- for x-axis. Command- for y-axis.
	Zoom in on a point in the graph	Shift-click-drag a rectangle around the point.
	Move graph sideways/up/down manually	Grab x-axis or y-axis and drag (must grab an axis)
	Reset graph to center on origin	Command-**r**
	Set exact graph size	Graph menu → Set 2D range
	Take axes on or off	Graph menu → Draw axes
SYMBOLS & FUNCTIONS	exponent	Shift-6 or ^
	$\sqrt{\ }$ (**r**oot)	Ctrl-Shift-**r**
	Get out of exponent or root	Right arrow
	$\sqrt[3]{\ }$ or $\sqrt[4]{\ }$ or…	Write as fractional exponent: $\sqrt[3]{x} = (x)^{1/3}$, $\sqrt[4]{x} = (x)^{1/4}$ etc.
	≤ or ≥	Ctrl-Shift-, (comma) or Ctrl-Shift-. (period)
	≠ (**n**ot equals)	Ctrl-Shift-**n**
	π (≈3.14) or e (≈2.718)	Type "pi" or "e"
	Δ (delta)	Option-j
	θ	Type "theta"
	String (of letters). Example: "Cost"	\Cost\ (both \ will disappear!) [\ is above Enter on keyboard]
	sin, cos, tan, csc, sec, cot…	Type "sin" "cos" "tan" "csc" "sec" "cot" etc. then Shift-9
	$\sin^{-1}$, $\cos^{-1}$ etc.	Type "asin" "acos" "atan" etc. then Shift-9
	⌊ ⌋ (floor) or ⌈ ⌉ (ceiling)	Type "floor" or "ceil" (for ceiling)
	r_f (subscript)	Ctrl-L
	∈ (is an **e**lement of) or … (an "ellipsis")	Ctrl-Shift-**e** or Ctrl-; (semicolon)
	∑ (**s**um) or ∫ (**i**ntegral) or $\frac{d}{dx}$ (**d**erivative)	Ctrl-Shift-**s** or Ctrl-Shift-**i** or Ctrl-Shift-**d**
OTHER	Start a new command line	Ctrl-Enter
	Start a new **t**ext (or notes) line	Ctrl-**t**
	Function notation like f(x) =	f Ctrl-9 x =
	Choosing a letter for variable/parameter	Only use x, y, r, θ for graphs, and n for the animation slider. Also t, u, v, w, z, e (≈2.718), and i ($\sqrt{-1}$) are for special use.
	Limit domain or range	After y= & comma. Example: $y = 3x, -2 < x \le 4$
	Write a piecewise function definition	Ctrl-Shift-a to get {. Type "if" to write if. Example: $y = \begin{cases} x^2 \text{ if } x < 5 \\ 3x + 10 \text{ if } x \ge 5 \end{cases}$
	Make a slider	Type "=slider(a,b,c)": $b = \text{slider}(0, 12, 6)$ b = 2 Here b varies from **0** to **12** in **6** steps (so 0, 2, 4, 6, 8, 10, 12)
	Set animation n slider options	Type "n" in text window, then click on n in slider at bottom
	Make animation n only play forwards	Option-click on ▷ in the slider at the bottom
	Put something typed in ( ) or numerator	Highlight what you want inside, then type (or /

	IF…	TRY…
COMMON PROBLEMS	Error: "A condition after the comma is not appropriate here"	
	Error: "Curve is outside the region shown"	Zoom out (to look at a bigger region)
	Error: "Undefined in the domain shown"	Make sure the lower bound of the domain isn't higher than the upper bound. Example: 3<x<2 means x can't be anything!
	My graph isn't showing!	If you defined a function like z(g), write y=z(x) on another next command line
	I tried to graph with function notation, and it is not working! Or it's just a flat line!	Make sure you always set x as the independent variable in the parentheses: y = f(x) even if the dep. value is f(k).
	My domain restriction isn't showing on graph!	If it's on the function definition line, move it to the y= line. Don't forget to change the variables to all x and y!
	It says my variable equals 1!	That's okay, if you haven't given your variable a value it assumes 1. Ignore that and go on!
	When I press ▷ on the n slider, the animation goes too fast/slow!	Click on n and change "Number of Steps" to be a much bigger number (to slow it down) or a much smaller number (to speed it up).
	I want to type a fraction but it's messing up! Ex: I want $\frac{4+6}{3}$ but I get $4+\frac{6}{3}$!!	Highlight what you want in the numerator, then type /.
	I'm not sure I understand GC well enough for the test.	The point of our class is NOT to learn GC, but to use GC to help us explore and learn ideas of *calculus*! We use GC because it uses mathematical language exactly the same as what we write on paper (especially function notation). This way we can avoid having to learn a "programming language" but still have the benefits of computer displays and animation.

*Anything in red is different between Apple & Windows