

Advanced Graphics in Microsoft Word

Isaac Greenspan

<http://talks.IsaacGreenspan.com/>

MMC Conference of Workshops
Lincoln-Way Central High School, New Lenox, IL
Saturday, January 28, 2012

This document is available online at
<http://talks.IsaacGreenspan.com/AdvancedGraphicsInWord-2012.pdf>

Please direct questions and comments on this document
to Isaac Greenspan at isaac@isaacgreenspan.com

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The Drawing Tools in Microsoft Word 2010

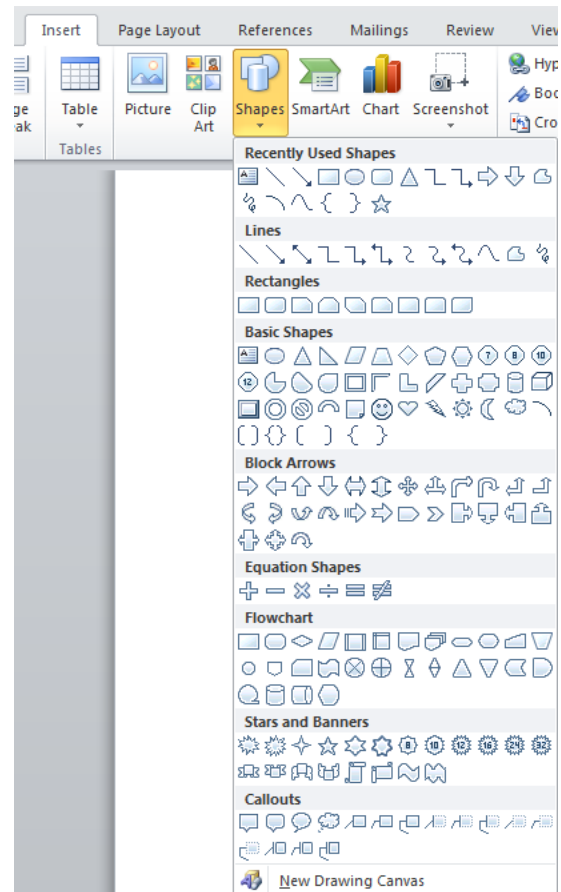
We will be primarily working with the Word drawing tools. Go to the “Insert” tab of the ribbon at the top of the window—the “Shapes” item there contains many of the specific object tools we want to use, such as the curve tool, the line tool, the rectangle tool, the ellipse tool, the text box tool, and various other types of objects. Our primary tools will be the line tool and the curve tool, though we will occasionally use other shapes. While we can use the arrow tool, we will generally use the line or curve tool, then add arrow styling afterwards.

Once you have inserted a shape of some sort, the ribbon will gain a “Drawing Tools Format” tab, which will come to the front. This tab of the ribbon contains style options for the inserted shapes as well as tools for aligning, grouping, arranging, and formatting objects.

For creating a drawing of any complexity, working in a document with text or anything else just complicates the work on the drawing. It is far simpler to work in a new, blank document. With the entire page blank, we are also free to use more space if we want and we can always scale down our drawing later.

Once we begin drawing, there are a few key things to keep in mind. When we are drawing two-dimensional objects, like rectangles and ellipses, holding down **[Shift]** will force the aspect ratio to be 1, forming squares and circles. Holding down **[Shift]** while drawing a line will force it to be horizontal, vertical, or at a 45° angle. When resizing an object, **[Shift]** will maintain the aspect ratio of a 2-D object and maintain the direction of a line.

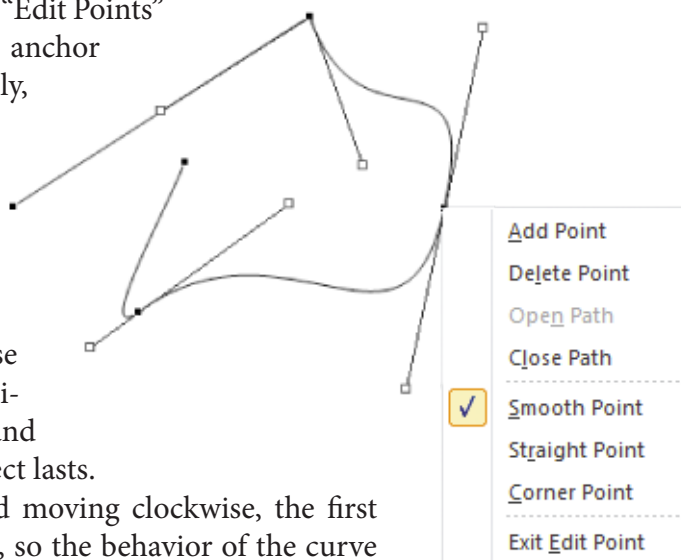
When we create a drawing composed of multiple objects, we will usually want to group those objects together so that they stay positioned properly and can be safely moved and resized. Grouping makes the collection of objects behave as a single object. For a group in particular, as well as for individual objects, we will often need to format it to behave in a particular way with respect to the rest of our Word document. While many people place their graphics in tables to position them, it is far better to use formatting to make the graphic interact well with the rest of your document. Key to this is the “Wrap Text” part of an object’s formatting (in the “Drawing Tools Format” tab of the ribbon). There are seven wrapping styles. “In line with text” is perhaps the least useful for any large object, as it treats the graphic like a very large single character in with the text. “Square,”



“Tight,” and “Through” cause the object to carve out space and force the text around the object with “Square” keeping the text out of a rectangular region containing the object, “Tight” allowing the text to come closer and mold around the shape of the object, and “Through” allowing the text to flow into any open spaces within the object. “Top and bottom” provides a more classical interjected figure, where text is above and below the object, but not exactly wrapped around it. “Behind text” and “In front of text” don’t wrap the text at all; these are most useful for our intermediate work when creating drawings.

The Curve Tool

The curve tool is one of the most powerful tools in Word. Curves are based on anchor points and behavior at those anchor points. In the composite screenshot below, we have a curve with five anchor points (black boxes). Once a curve is drawn (or, rather, roughed in), we can fine tune it using the “Edit Points” feature, where we are presented with the anchor points to move, select, and modify. Normally, the “handles” coming from the anchor points and ending in white boxes are not shown unless an anchor point is selected and then are only shown for one point at a time (at right is a composite of several screen images to show the various types of anchor points). These handles, roughly speaking, determine the direction of the curve at the anchor point and how far away from the anchor point the effect lasts.



Beginning from the leftmost point and moving clockwise, the first point is an “Auto Point” and has no handle, so the behavior of the curve at that point is largely governed by the surrounding points. The segment joining that point to the second point is set as a “Straight Segment,” as opposed to the rest of the segments which are set as “Curved Segment.” The second anchor point is a “Corner Point,” so the two handles move completely independently from one another, allowing a sharp corner in the curve. The third anchor point, as shown in the menu, is a “Smooth Point,” so the handles are always the same length and in opposite directions, leading to a smooth curve. The fourth point is a “Straight Point,” similar to the “Smooth Point” but allowing the handles to have different lengths. The final point, like the first, is an “Auto Point.”

Sketchpad & Graphs

Sketchpad is likely the most readily available tool for graphing functions (among other things) for most teachers. The way that graphics from Sketchpad 4 (and earlier) copy and paste into Word (at least, with the default settings) rendered them virtually unusable, but Sketchpad 5 graphics copy

and paste much better. Even so, the options for styling the graphic within Sketchpad are limited; we can, however, use these graphics as an easy template for us to create better-looking curves using Word's drawing tools.

To get a graph from Sketchpad into Word, create the graph in Sketchpad (use "Plot New Function," repeat for multiple graphs together), adjust the window and the scale (move the point at the origin and/or the point at one on the axis/axes) so that what shows in the window is what you want to copy to Word, then select only the axes and the curves you want to bring into Word and copy/paste into Word. By default, we will end up pasting an image that is formatted to be in line with text. In order to trace over it, we need to format it to be "Behind text" so that it is behind anything else we're working on and can move freely. It is generally best to create your axes before copying in the Sketchpad graph, then take the Sketchpad graph and move it into alignment with your axes. This can take several cycles through nudging it into place (matching the origins) and resizing so that the scales match (this may need to be done through the object formatting in order to get fine enough control over the size). Once the Sketchpad graph is lined up with your axes, you can use the Word drawing tools to create your graph directly on top of the Sketchpad graph, using it as a template. When you are done, select the Sketchpad graph and delete it.

The Evils of Text Boxes

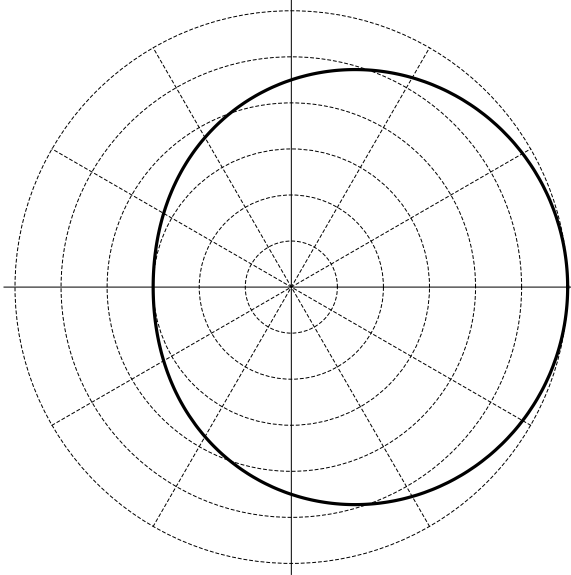
While Word has a "Text box" tool, it is best to avoid it entirely. The default settings for a text box include a border, a white background (that covers other objects), and a fairly large internal margin. These are all fixable, but there is a more fundamental flaw: though you can resize text boxes (particularly when they are grouped with other objects), the text inside them will not scale with the box, nor will the margins scale. The result is that if you use a text box grouped with other objects and attempt to resize the grouped objects, the text may be cut off or vanish, generally making the drawing harder to maintain.

Fortunately, MathType allows us to type anything we could have typed into a text box and MathType objects are better behaved. By default, MathType objects are transparent and have no border. While MathType objects that are pasted in have the default layout setting of "In line with text," this is easily fixed (setting the layout to "In front of text" allows the object to move freely and be easily placed into drawings). In fact, when we need many MathType elements in a drawing, we can duplicate a properly-formatted one and edit the contents rather than having to repeat the formatting. These MathType objects can be grouped with other drawing objects and behave just like any other drawing object. In particular, MathType objects can be resized and their contents will scale properly. Because of all these advantages, it is greatly preferable to exclusively use MathType objects for labeling drawings in Word.

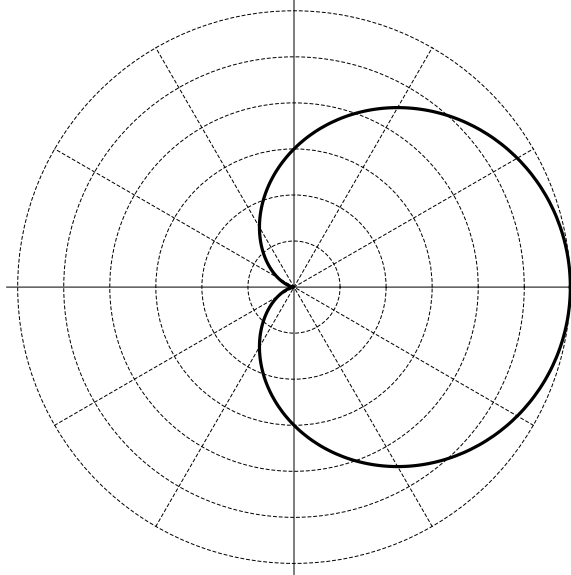
Exercises

Recreate each of the following standard polar graphs. A good place to start would be creating a blank polar grid (lots of circles and lines, changing the line styles here and there, and an opportunity to try out the rotation and alignment mechanisms in the drawing menu). For the graphs of each, you will probably want to use a Sketchpad graph as a template and it may save time if you make use of symmetry.

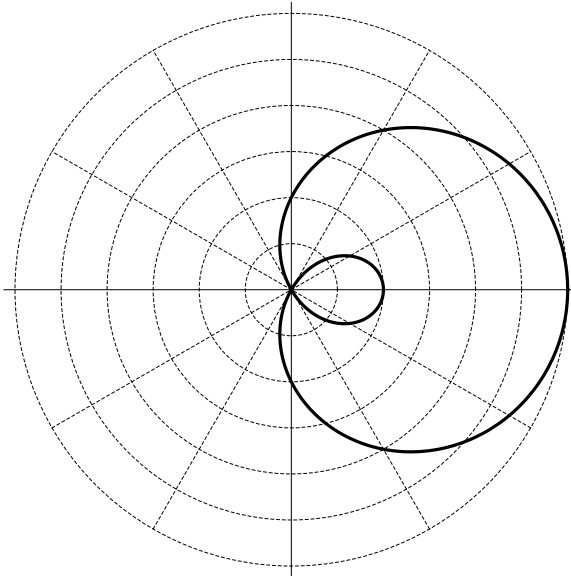
$$r = 4.5 + 1.5 \cos \theta$$



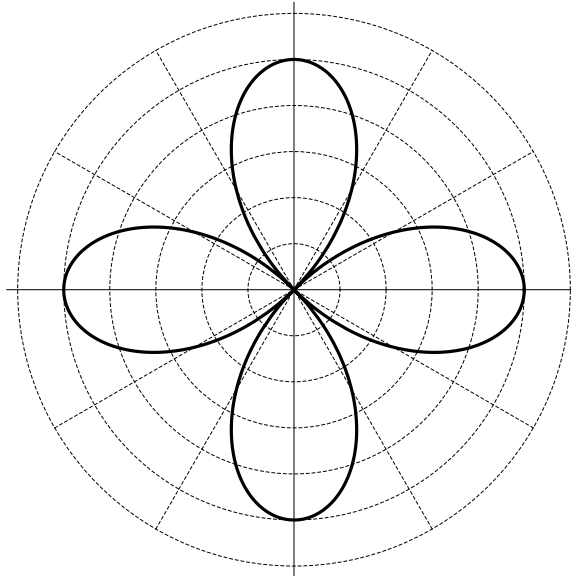
$$r = 3 + 3 \cos \theta$$





$$r = 2 + 4 \cos \theta$$



$$r = 5 \cos 2\theta$$



General Shortcut Keys

Cut	Ctrl / ⌘ + X
Copy	Ctrl / ⌘ + C
Paste	Ctrl / ⌘ + V
Select All	Ctrl / ⌘ + A
Undo	Ctrl / ⌘ + Z
Redo	Ctrl / ⌘ + Y OR ⌘ + Shift + Z
Application Switching	Alt + Tab (hold Alt to display list of apps) OR ⌘ + Tab (hold ⌘ for list of apps)
Close Window	Alt + F4 OR Ctrl + F4 (depending on context) OR ⌘ + W (or ⌘ + H hides an app)
Misbehaving Programs	Ctrl + Alt + Delete (Task Manager, "End Process") OR ⌘ + Cmd + Esc ("Force Quit")
	 Windows  Macintosh

Word Shortcut Keys

Bold	Ctrl / ⌘ + B
Italics	Ctrl / ⌘ + I
Underline	Ctrl / ⌘ + U
Center Align	Ctrl / ⌘ + E
Hanging Indent	Ctrl / ⌘ + T
Move to Beginning/End of Line	Home End
Move Forward One Word	Ctrl / ⌘ + →
Move Back One Word	Ctrl / ⌘ + ←
Move Down One Paragraph	Ctrl / ⌘ + ↓
Move Up One Paragraph	Ctrl / ⌘ + ↑
Move to Top of Document	Ctrl / ⌘ + Home
Move to End of Document	Ctrl / ⌘ + End
New Page (not new section)	Ctrl / ⌘ + ↵

MathType Shortcut Keys

Parentheses	Ctrl / ⌘ + 9
Absolute Value	Ctrl / ⌘ + T, (vertical bar)
Exponent/Superscript	Ctrl + H OR ⌘ + E
Subscript	Ctrl / ⌘ + L
Fraction (full-size)	Ctrl / ⌘ + F
Fraction (small)	Ctrl / ⌘ + T, Shift + F
Square Root	Ctrl / ⌘ + R
Less Than or Equal To	Ctrl / ⌘ + K, <
Greater Than or Equal To	Ctrl / ⌘ + K, >
Not Equal	Ctrl / ⌘ + K, +
Approximately Equal	Ctrl / ⌘ + , ~
Congruent (Modulo)	Ctrl / ⌘ + K, =
Plus or Minus	Ctrl / ⌘ + Shift + K, =
Minus or Plus	Ctrl / ⌘ + Shift + K, +
Multiplication-type Dot	Ctrl / ⌘ + Shift + K, •
Angle Symbol	Ctrl / ⌘ + Shift + K, A
Degree Symbol	Ctrl / ⌘ + Shift + K, D
Thin Space	Ctrl / ⌘ + []
Em Space	Ctrl / ⌘ + K, 4
Baseline Horiz. Ellipsis	Ctrl / ⌘ + []
Centered Horiz. Ellipsis	Ctrl / ⌘ + []
	A B C D E F G H I
	A B X Δ E Φ Γ H I
Greek Letters (Uppercase)	J K L M N O P Q R
Ctrl / ⌘ + G, Shift +	θ K Λ M N O Π Θ P
	S T U V W X Y Z
	Σ T Y ζ Ω Ξ Ψ Z
	A B C D E F G H I
	α β χ δ ε φ γ η ι
Greek Letters (Lowercase)	J K L M N O P Q R
Ctrl / ⌘ + G,	φ κ λ μ ν ο π θ ρ
	S T U V W X Y Z
	σ τ υ ω ω ξ ψ ζ