Polar Graphs

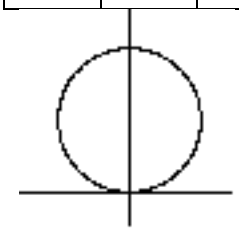
When graphing polar equations, consider θ values where:

1. Graph starts and ends
2. r is at a maximum
3. r is at a minimum
4. r = 0 (often this is where r changes signs)

$r = \sin\theta$ The most valuable values of θ are at the beginning and end of quadrants.

Perform Whole Quadrant Sweeps

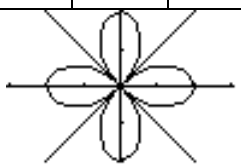
θ	0	$\pi/2$	π	$3\pi/2$	2π
r	0	1	0	-1	0



$r = 2\cos 2\theta$ The most valuable values of θ are at intervals of $\frac{\pi}{4}$.

Break each quadrant into halves

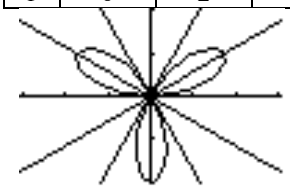
θ	0	$\pi/4$	$\pi/2$	$3\pi/4$	π	$5\pi/4$	$3\pi/2$	$7\pi/4$	2π
r	2	0	-2	0	2	0	-2	0	2



$r = 2\sin 3\theta$ The most valuable values of θ are at intervals of $\frac{\pi}{6}$.

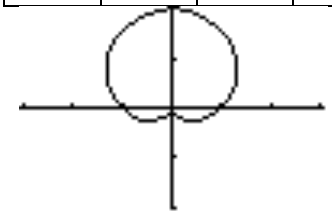
Break each quadrant into thirds

θ	0	$\pi/6$	$\pi/3$	$\pi/2$	$2\pi/3$	$5\pi/6$	π	$7\pi/6$	$4\pi/3$	$3\pi/2$	$5\pi/3$	$11\pi/6$	2π
r	0	2	0	-2	0	2	0	-2	0	2	0	-2	0



$r = \sin\theta - 1$ The most valuable values of θ are at the beginning and end of quadrants.

θ	0	$\pi/2$	π	$3\pi/2$	2π
r	-1	0	-1	-2	-1



1. $\lim_{x \to 2} \frac{x^2 + x - 6}{2x^2 - 5x + 2}$

2. $\lim_{x \to 5} \frac{\sqrt{x - 4} - 1}{x - 5}$

3. $\lim_{x \to 1} \frac{x}{x^2 - x}$

4. $f(x) = 3x^3 + 2x$ Use the limit definition to find the slope of f at $x = 4$.

5. $\lim_{x \to 2} \frac{\lvert x-2 \rvert}{x-2}$
6. $\lim_{x \to 0^+} \sqrt{x}$

Graph the following Polar Functions on the Polar Plane.

7. $r = 1 + 2 \cos \phi$	8. $r = 8 \cos 3\phi$	9. $r = 3 + 3 \cos \phi$
10. $r = 2 - 2 \sin \phi$	11. $r = 4 \csc \phi$	12. $r = 8 \cos 5\phi$