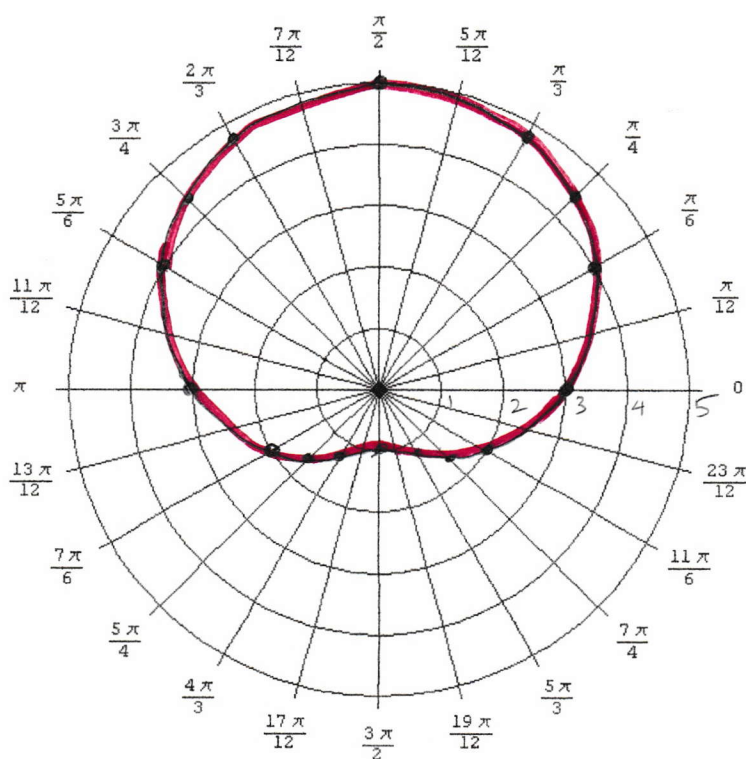


Sketch the polar graph $r = 3 + 2\sin\theta$ by first completing the table of r -values for the given list of θ -values.

Give the exact value of r in each case, as well as a decimal approximation to 1 decimal place. Use $\sqrt{2} \approx 1.4$ and $\sqrt{3} \approx 1.8$.

Then plot all 17 points, and connect with a smooth curve in increasing order of θ .

$\theta =$	$r = 3 + 2\sin\theta$ (exact value, may involve radicals)	$r = 3 + 2\sin\theta$ (rounded to 1 decimal place)	(r, θ)
0	$3 + 2(0) = 3$	3.0	(3.0, 0)
$\frac{\pi}{6}$	$3 + 2(\frac{1}{2}) = 4$	4.0	(4.0, $\frac{\pi}{6}$)
$\frac{\pi}{4}$	$3 + 2(\frac{\sqrt{2}}{2}) = 3 + \sqrt{2}$	4.4	(4.4, $\frac{\pi}{4}$)
$\frac{\pi}{3}$	$3 + 2(\frac{\sqrt{3}}{2}) = 3 + \sqrt{3}$	4.8	(4.8, $\frac{\pi}{3}$)
$\frac{\pi}{2}$	$3 + 2(1) = 5$	5.0	(5.0, $\frac{\pi}{2}$)
$\frac{2\pi}{3}$	$3 + 2(\frac{\sqrt{3}}{2}) = 3 + \sqrt{3}$	4.8	(4.8, $\frac{2\pi}{3}$)
$\frac{3\pi}{4}$	$3 + 2(\frac{\sqrt{2}}{2}) = 3 + \sqrt{2}$	4.4	(4.4, $\frac{3\pi}{4}$)
$\frac{5\pi}{6}$	$3 + 2(\frac{1}{2}) = 4$	4.0	(4.0, $\frac{5\pi}{6}$)
π	$3 + 2(0) = 3$	3.0	(3.0, π)
$\frac{7\pi}{6}$	$3 + 2(-\frac{1}{2}) = 2$	2.0	(2.0, $\frac{7\pi}{6}$)
$\frac{5\pi}{4}$	$3 + 2(-\frac{\sqrt{2}}{2}) = 3 - \sqrt{2}$	1.6	(1.6, $\frac{5\pi}{4}$)
$\frac{4\pi}{3}$	$3 + 2(-\frac{\sqrt{3}}{2}) = 3 - \sqrt{3}$	1.2	(1.2, $\frac{4\pi}{3}$)
$\frac{3\pi}{2}$	$3 + 2(-1) = 1$	1.0	(1.0, $\frac{3\pi}{2}$)
$\frac{5\pi}{3}$	$3 + 2(-\frac{\sqrt{3}}{2}) = 3 - \sqrt{3}$	1.2	(1.2, $\frac{5\pi}{3}$)
$\frac{7\pi}{4}$	$3 + 2(-\frac{\sqrt{2}}{2}) = 3 - \sqrt{2}$	1.6	(1.6, $\frac{7\pi}{4}$)
$\frac{11\pi}{6}$	$3 + 2(-\frac{1}{2}) = 2$	2.0	(2.0, $\frac{11\pi}{6}$)
2π	$3 + 2(0) = 3$	3.0	(3.0, 2π)



Sketch the polar graph $r = 1 - 2\cos 2\theta$ by first completing the table of r -values for the given list of θ -values.

Give the exact value of r in each case, as well as a decimal approximation to 1 decimal place. Use $\sqrt{2} \approx 1.4$ and $\sqrt{3} \approx 1.8$.

Then plot all 17 points, and connect with a smooth curve in increasing order of θ .

$\theta =$	$r = 1 - 2\cos 2\theta$ (exact value, may involve radicals)	$r = 1 - 2\cos 2\theta$ (rounded to 1 decimal place)	(r, θ)
0	$1 - 2\cos 0 = 1 - 2(1) = -1$	-1.0	$(-1, 0)$
$\frac{\pi}{6}$	$1 - 2\cos \frac{\pi}{3} = 1 - 2(\frac{1}{2}) = 0$	0.0	$(0, \frac{\pi}{6})$
$\frac{\pi}{4}$	$1 - 2\cos \frac{\pi}{2} = 1 - 2(0) = 1$	1.0	$(1, \frac{\pi}{4})$
$\frac{\pi}{3}$	$1 - 2\cos \frac{2\pi}{3} = 1 - 2(-\frac{1}{2}) = 2$	2.0	$(2, \frac{\pi}{3})$
$\frac{\pi}{2}$	$1 - 2\cos \pi = 1 - 2(-1) = 3$	3.0	$(3, \frac{\pi}{2})$
$\frac{2\pi}{3}$	$1 - 2\cos \frac{4\pi}{3} = 1 - 2(-\frac{1}{2}) = 2$	2.0	$(2, \frac{2\pi}{3})$
$\frac{3\pi}{4}$	$1 - 2\cos \frac{3\pi}{2} = 1 - 2(0) = 1$	1.0	$(1, \frac{3\pi}{4})$
$\frac{5\pi}{6}$	$1 - 2\cos \frac{5\pi}{3} = 1 - 2(\frac{1}{2}) = 0$	0.0	$(0, \frac{5\pi}{6})$
π	$1 - 2\cos 2\pi = 1 - 2(1) = -1$	-1.0	$(-1, \pi)$
$\frac{7\pi}{6}$	$1 - 2\cos \frac{7\pi}{3} = 1 - 2(\frac{1}{2}) = 0$	0.0	$(0, \frac{7\pi}{6})$
$\frac{5\pi}{4}$	$1 - 2\cos \frac{5\pi}{2} = 1 - 2(0) = 1$	1.0	$(1, \frac{5\pi}{4})$
$\frac{4\pi}{3}$	$1 - 2\cos \frac{8\pi}{3} = 1 - 2(-\frac{1}{2}) = 2$	2.0	$(2, \frac{4\pi}{3})$
$\frac{3\pi}{2}$	$1 - 2\cos 3\pi = 1 - 2(-1) = 3$	3.0	$(3, \frac{3\pi}{2})$
$\frac{5\pi}{3}$	$1 - 2\cos \frac{10\pi}{3} = 1 - 2(-\frac{1}{2}) = 2$	2.0	$(2, \frac{5\pi}{3})$
$\frac{7\pi}{4}$	$1 - 2\cos \frac{7\pi}{2} = 1 - 2(0) = 1$	1.0	$(1, \frac{7\pi}{4})$
$\frac{11\pi}{6}$	$1 - 2\cos \frac{11\pi}{3} = 1 - 2(\frac{1}{2}) = 0$	0.0	$(0, \frac{11\pi}{6})$
2π	$1 - 2\cos 2\pi = 1 - 2(1) = -1$	-1.0	$(-1, 2\pi)$

