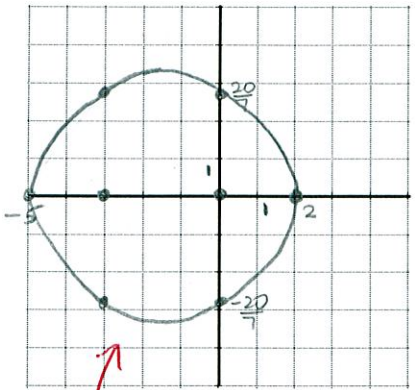
Consider the graph of the polar equation $r = \dfrac{20}{7+3\cos\theta}$. $= \dfrac{\frac{20}{7}}{1+\frac{3}{7}\cos\theta}$

SCORE: ____ / 9 PTS



GRADED BY ME

θ	r
0	$\frac{20}{10} = 2$
$\frac{\pi}{2}$	$\frac{20}{7} = 2\frac{6}{7}$
π	$\frac{20}{4} = 5$
$\frac{3\pi}{2}$	$\frac{20}{7} = 2\frac{6}{7}$

[a] Fill in the blanks.

[i] The eccentricity is $\frac{3}{7}$ (1).

[ii] The shape of the graph is a/an ELLIPSE (1).

[iii] The equation of the directrix is $x = \frac{20}{3}$ (1).

$ep = \frac{20}{7}$

$\frac{3}{7}p = \frac{20}{7}$

$p = \frac{20}{3}$

[iv] Find the **rectangular** coordinates of the

x – intercept(s): $(-5,0), (2,0)$ (1)

y – intercept(s): $(0, \frac{20}{7}), (0, -\frac{20}{7})$ (1)

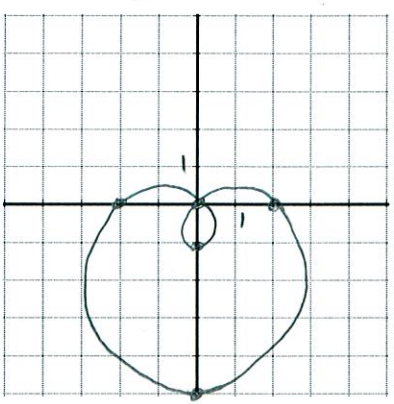
focus/foci $2+-5=-3$: $(-3,0), (0,0)$ (1)

endpoints of the latus rectum/latera recta: $(-3, \pm\frac{20}{7}), (0, \pm\frac{20}{7})$ (1)

[b] Sketch the graph on the grid provided above. **You must provide a scale for the axes & plot all points from part [a][iv] above.**

Consider the graph of the polar equation $r = 2 - 3\sin\theta$. $0 < \left|\frac{2}{-3}\right| < 1$

SCORE: ____ / 6 PTS



GRADED BY ME

θ	r
0	2
$\frac{\pi}{2}$	-1
π	2
$\frac{3\pi}{2}$	5

[a] Fill in the blanks.

[i] The shape of the graph is a/an LIMAÇON WITH LOOP (1).

[ii] The graph DOES (1) pass through the pole.

does / does not

[iii] Find the **rectangular** coordinates of the

x – intercept(s): $(0,0), (3,0), (-2,0)$ (1)

y – intercept(s): $(0,0), (0,-1), (0,-5)$ (1)

[b] Sketch the graph on the grid provided above. **You must provide a scale for the axes & plot all points from part [a][iii] above.**

Consider the graph of the polar equation $r = 2 - 2\sin 2\theta$.

SCORE: _____ / 15 PTS

NOTE: $(r, \pi-\theta)$ and $(-r, \pi-\theta)$ tests do NOT show that the graph is symmetric

$\theta = \frac{\pi}{2}$ POLAR AXIS

[a] **Using the information above, and the tests and shortcuts shown in lecture**, test if the graph is symmetric over the pole, the polar axis, and/or $\theta = \frac{\pi}{2}$. State your conclusions in the table. **NOTE: Run as FEW tests as needed to prove your answers are correct.**

$\theta = \frac{\pi}{2}$: $-r = 2 - 2\sin 2(-\theta)$

$-r = 2 + 2\sin 2\theta$

(1) $r = -2 - 2\sin 2\theta$ ×

POLAR AXIS: $r = 2 - 2\sin 2(-\theta)$

(1) $r = 2 + 2\sin 2\theta$ ×

POLE: $r = 2 - 2\sin 2(\pi + \theta)$

$r = 2 - 2\sin(2\pi + 2\theta)$

$r = 2 - 2[\sin 2\pi \cos 2\theta + \cos 2\pi \sin 2\theta]$

(1) $r = 2 - 2\sin 2\theta$ ✓

"NO" AND "NOT SYMMETRIC" ARE INCORRECT

Type of symmetry	Conclusion
Over the polar axis	NO CONCLUSION
Over $\theta = \frac{\pi}{2}$	NO CONCLUSION
Over the pole	SYMMETRIC

(2) IF ALL 3 CORRECT

(1) IF 2 OF 3 CORRECT

(0) IF NONE OR ONLY 1 CORRECT

[b] Based on the results of part [a], what is the minimum interval of the graph you need to plot first (before using reflections to draw the rest of the graph) ?

$[0, \pi]$ OR $[-\frac{\pi}{2}, \frac{\pi}{2}]$ (1) EITHER ANSWER IS OK

[c] Find the angles in the minimum interval in part [b] at which the graph goes through the pole.

$0 = 2 - 2\sin 2\theta$

(1) $\sin 2\theta = 1$

IF USING $[0, \pi]$, $0 \le 2\theta \le 2\pi$, so $2\theta = \frac{\pi}{2}$

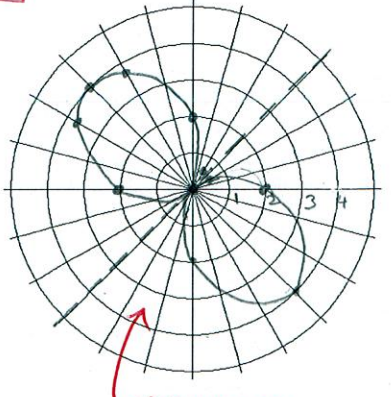
(1) $\theta = \frac{\pi}{4}$

IF USING $[-\frac{\pi}{2}, \frac{\pi}{2}]$, $-\pi \le 2\theta \le \pi$, so $2\theta = \frac{\pi}{2}$, $\theta = \frac{\pi}{4}$

[d] Find the value of r for all common angles in the minimum interval in part [b].

θ	r
0	(½) 2
$\frac{\pi}{6}$	(½) $2 - \sqrt{3} \approx 0.2$
$\frac{\pi}{4}$	0
$\frac{\pi}{3}$	(½) $2 - \sqrt{3} \approx 0.2$
$\frac{\pi}{2}$	(½) 2

θ	r
$-\frac{\pi}{2}$ OR $\frac{2\pi}{3}$	(½) $2 + \sqrt{3} \approx 3.8$
$-\frac{\pi}{4}$ OR $\frac{3\pi}{4}$	(½) 4
$-\frac{\pi}{6}$ OR $\frac{5\pi}{6}$	(½) $2 + \sqrt{3} \approx 3.8$
$-\frac{\pi}{2}$ OR π	(½) 2



GRADED BY ME

[d] Sketch the graph on the grid provided below. **You must provide a scale for the polar axis & plot all points from part [c] above.**