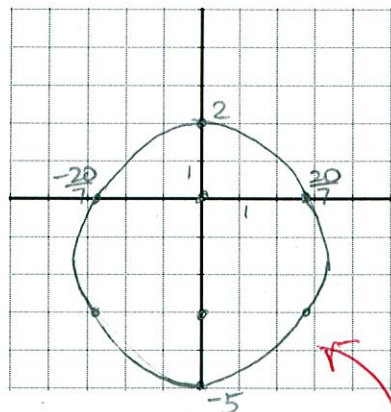


Consider the graph of the polar equation $r = \frac{20}{7+3\sin\theta} = \frac{20}{1+\frac{3}{7}\sin\theta}$

SCORE: ____ / 9 PTS



[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 $y = \frac{20}{3}$ ①

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

x - intercept(s)

$(\frac{20}{7}, 0), (-\frac{20}{7}, 0)$ ①

y - intercept(s)

$(0, 2), (0, -5)$ ①

focus/foci $2 + -5 = -3$

$(0, 0), (0, -3)$ ①

endpoints of the latus rectum/latera recta

$(\pm \frac{20}{7}, 0), (\pm \frac{20}{7}, -3)$ ①

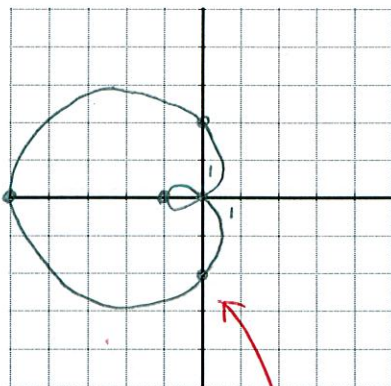
θ	r
0	$\frac{20}{7} = 2\frac{6}{7}$
$\frac{\pi}{2}$	$\frac{20}{10} = 2$
π	$\frac{20}{7} = 2\frac{6}{7}$
$\frac{3\pi}{2}$	$\frac{20}{-5} = -4$

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[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 $r = 2 - 3\cos\theta$. $0 < |\frac{2}{-3}| < 1$

SCORE: ____ / 6 PTS



[a] Fill in the blanks.

[i] The shape of the graph is a/an LIMACON 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)

$(0, 0), (-1, 0), (-5, 0)$ ①

y - intercept(s)

$(0, 0), (0, 2), (0, -2)$ ①

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

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[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.

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

- [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.**

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

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

$$\textcircled{1} \quad r = -2 + 2\sin 2\theta \quad \times$$

$$\text{POLAR AXIS: } r = 2 + 2\sin 2(-\theta)$$

$$\textcircled{1} \quad r = 2 - 2\sin 2\theta \quad \times$$

$$\text{POLE: } r = 2 + 2\sin 2(\pi + \theta)$$

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

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

$$\textcircled{1} \quad r = 2 + 2\sin 2\theta \quad \checkmark$$



"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

IF ALL 3 CORRECT

IF 2 OF 3 CORRECT

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 $[-\frac{\pi}{2}, \frac{\pi}{2}]$. $\textcircled{1}$ EITHER ANSWER IS OK

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

$$0 = 2 + 2\sin 2\theta$$

$$\textcircled{1} \quad \sin 2\theta = -1$$

$$\text{IF USING } [0, \pi]$$

$$0 \leq 2\theta \leq 2\pi$$

$$2\theta = \frac{3\pi}{2}$$

$$\theta = \frac{3\pi}{4}$$

$$\text{IF USING } [-\frac{\pi}{2}, \frac{\pi}{2}]$$

$$-\pi \leq 2\theta \leq \pi$$

$$2\theta = -\frac{\pi}{2}$$

$$\theta = -\frac{\pi}{4}$$

$\textcircled{1}$ MUST MATCH YOUR INTERVAL IN [b]

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

$$\theta$$

$$\frac{\pi}{6}$$

$$\frac{\pi}{4}$$

$$\frac{\pi}{3}$$

$$\frac{\pi}{2}$$

$$\textcircled{1} \quad r$$

$$\textcircled{1} \quad [2 + \sqrt{3} \approx 3.8]$$

$$\textcircled{1} \quad [4]$$

$$\textcircled{1} \quad [2 + \sqrt{3} \approx 3.8]$$

$$\textcircled{1} \quad [2]$$

$$\theta$$

$$-\frac{\pi}{3} \text{ or } \frac{2\pi}{3}$$

$$-\frac{\pi}{4} \text{ or } \frac{3\pi}{4}$$

$$-\frac{\pi}{6} \text{ or } \frac{5\pi}{6}$$

$$-\frac{\pi}{2} \text{ or } \pi$$

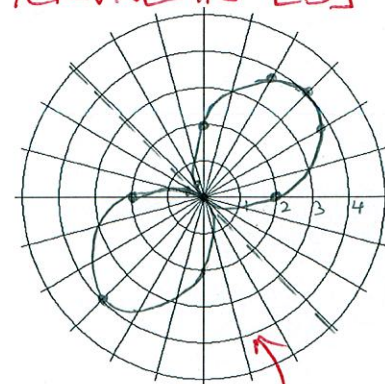
$$\textcircled{1} \quad r$$

$$\textcircled{1} \quad [2 - \sqrt{3} \approx 0.2]$$

$$0$$

$$\textcircled{1} \quad [2 - \sqrt{3} \approx 0.2]$$

$$\textcircled{1} \quad [2]$$



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- [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.**