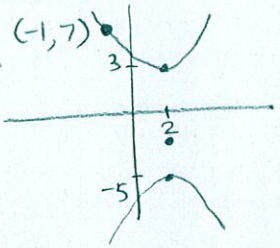
Consider the hyperbola which passes through the point $(-1, 7)$, with vertices $(2, -5)$ and $(2, 3)$. **SCORE: ____ / 8 PTS**

[a] Find the standard form of the equation of the hyperbola.



CENTER $= \left(2, \frac{-5+3}{2}\right) = (2,-1)$ (½)

$a = \frac{3--5}{2}$ OR $3--1 = 4$ (1)

$\frac{(y+1)^2}{16} - \frac{(x-2)^2}{b^2} = 1$

$\frac{(7+1)^2}{16} - \frac{(1-2)^2}{b^2} = 1$

$4 - \frac{9}{b^2} = 1$ (1)

$\frac{9}{b^2} = 3$

$b^2 = 3$

$\frac{(y+1)^2}{16} - \frac{(x-2)^2}{3} = 1$

(1) (1½) (½)

[b] Find the **slope-point form** of the equation of the asymptotes.

SLOPE $= \pm \frac{\sqrt{16}}{\sqrt{3}} = \pm \frac{4\sqrt{3}}{3}$

$y+1 = \pm \frac{4\sqrt{3}}{3}(x-2)$

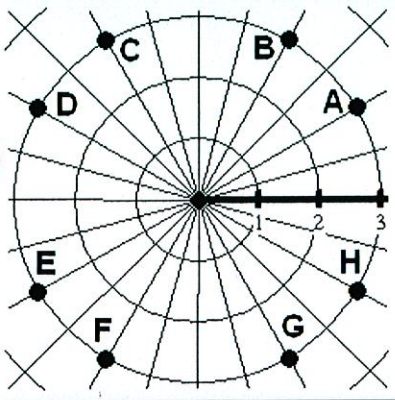
(½) (½) (1) (½)

Fill in the blanks. **SCORE: ____ / 3 PTS**

[a] The shape of the graph of $9x^2 + 9x - 11y + 13 = 0$ is a/an PARABOLA. (1½)

[b] The shape of the graph of $7x^2 - 6x + 5y^2 + 8y - 10 = 0$ is a/an ELLIPSE. (1½)

Fill in the blanks using the graph on the right. **SCORE: ____ / 4 PTS**



[a] The polar co-ordinates $(3, -\frac{2\pi}{3})$ refers to point F. (1)

[b] The polar co-ordinates $(-3, \frac{7\pi}{6})$ refers to point A. (1)

[c] The polar co-ordinates $(-3, \frac{-\pi}{6})$ OR $\frac{11\pi}{6}$ refers to point D. (2)

Convert the polar equation $r^2 = \sin 2\theta$ into rectangular form. **SCORE: ____ / 6 PTS**

$r^2 = 2\sin\theta\cos\theta$ (2)

$r^2 r^2 = 2(r\sin\theta)(r\cos\theta)$ (2)

$(x^2+y^2)^2 = 2xy$ (1) (1)

Convert the rectangular coordinates $(-6, -2\sqrt{3})$ into polar coordinates. **SCORE: ____ / 3 PTS**

Write your final answer in proper notation.

$r^2 = 36+12 = 48 \rightarrow r = 4\sqrt{3}$ (1)

$\cos\theta = \frac{-6}{4\sqrt{3}} = -\frac{\sqrt{3}}{2}$

$\sin\theta = \frac{-2\sqrt{3}}{4\sqrt{3}} = -\frac{1}{2}$

$\theta = \frac{7\pi}{6}$ OR $-\frac{5\pi}{6}$ OR (1 1/2)

$(4\sqrt{3}, \frac{7\pi}{6})$ OR $(4\sqrt{3}, -\frac{5\pi}{6})$

(1/2) FOR PROPER FORMAT [r FIRST, θ SECOND, PARENTHESES + COMMA)

Test the polar equation $r = 1 + 2\sin\theta$ for symmetry with respect to the pole. **SCORE: ____ / 6 PTS**

State your conclusion clearly.

$(-r, \theta)$

$-r = 1 + 2\sin\theta$ (1)

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

NO CONCLUSION

$(r, \pi+\theta)$

$r = 1 + 2\sin(\pi+\theta)$ (1)

$r = 1 + 2[\sin\pi\cos\theta + \cos\pi\sin\theta]$

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

NO CONCLUSION (1)

Convert the rectangular equation $5x - 4y + 3 = 0$ into polar form. **SCORE: ____ / 5 PTS**

Remember to solve for *r*.

$5r\cos\theta - 4r\sin\theta + 3 = 0$ (2)

$r(5\cos\theta - 4\sin\theta) = -3$ (2)

$r = \frac{-3}{5\cos\theta - 4\sin\theta}$ OR $\frac{3}{4\sin\theta - 5\cos\theta}$ (1)