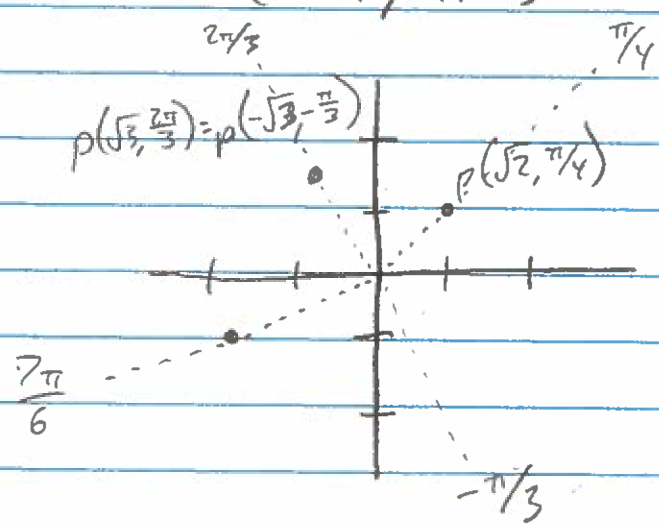
① Convert $p(\sqrt{3}, 2\pi/3)$, $p(\sqrt{2}, \pi/4)$, $p(2, 7\pi/6)$, $p(-\sqrt{3}, -\pi/3)$ to Cartesian and plot in the xy plane.

$$p(\sqrt{3}, 2\pi/3) = (r\cos\theta, r\sin\theta)$$
$$= (\sqrt{3}\cos 2\pi/3, \sqrt{3}\sin 2\pi/3)$$
$$= (\sqrt{3}(-1/2), \sqrt{3}(\sqrt{3}/2))$$
$$= (-\sqrt{3}/2, 3/2)$$
$$\approx (-0.9, 1.5)$$

$$p(\sqrt{2}, \pi/4) = (r\cos\theta, r\sin\theta)$$
$$= (\sqrt{2}\cos\tfrac{\pi}{4}, \sqrt{2}\sin\tfrac{\pi}{4})$$
$$= (\sqrt{2}(\sqrt{2}/2), \sqrt{2}(\sqrt{2}/2))$$
$$= (1, 1)$$

$$p(2, 7\pi/6) = (2\cos(\tfrac{7\pi}{6}), 2\sin(\tfrac{7\pi}{6}))$$
$$= (2(-\sqrt{3}/2), 2(-1/2))$$
$$= (-\sqrt{3}, -1)$$
$$\approx (-1.7, -1)$$

$$p(-\sqrt{3}, -\pi/3) = (-\sqrt{3}\cos(-\pi/3), -\sqrt{3}\sin(-\pi/3))$$
$$= (-\sqrt{3}(1/2), -\sqrt{3}(-\sqrt{3}/2))$$
$$= (-\sqrt{3}/2, -3/2)$$
$$\approx (-0.9, 1.5)$$



② Convert $(4,-4)$, $(-\frac{3}{2}, -\sqrt{3}/2)$ to polar.

$\boxed{(4,-4)}$

$x^2+y^2=r^2$

$4^2+(-4)^2=r^2$

$(16)(2)=r^2$

$4\sqrt{2}=r$

$\tan\theta = y/x$

$\tan\theta = -4/4$

$\tan\theta = -1$

$\theta = -\pi/4$

$\boxed{p(4\sqrt{2}, -\pi/4)}$

(OR $7\pi/4$)

$\boxed{(-3/2, -\sqrt{3}/2)}$

$x^2+y^2=r^2$

$9/4 + 3/4 = r^2$

$12/4 = r^2$

$3 = r^2$

$\sqrt{3} = r$

$\tan\theta = \frac{-\sqrt{3}/2}{-3/2}$

$\tan\theta = -\sqrt{3}/3$

$\tan\theta = -1/\sqrt{3}$

$\theta = 7\pi/6$

$\boxed{p(\sqrt{3}, 7\pi/6)}$

OR $-5\pi/6$

③ Convert $r = \frac{5}{\sqrt{25-9\sin^2\theta}}$ into a Cartesian equation. Name the curve.

$$r^2 = \frac{25}{25-9\sin^2\theta}$$

$$25r^2 - 9r^2\sin^2\theta = 25$$

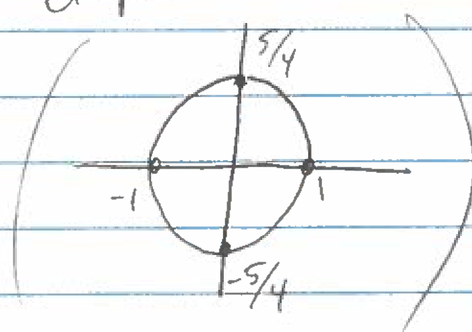
$$25(r^2) - 9(r\sin\theta)^2 = 25$$

$$25(x^2+y^2) - 9(y)^2 = 25$$

$$25x^2 + 25y^2 - 9y^2 = 25$$

$$\boxed{25x^2 + 16y^2 = 25}$$

ellipse



(4) Convert $1-\frac{y}{x^2+y^2}=\frac{3}{\sqrt{x^2+y^2}}$ into polar.

$$1-\frac{\cancel{r}\sin\theta}{r^{\cancel{2}}}=\frac{3}{\sqrt{r^2}}$$

$$1-\frac{\sin\theta}{r}=\frac{3}{r}$$

$$r-\sin\theta=3$$

$$\boxed{r=3+\sin\theta}$$

(5) Convert the line $y = \frac{x}{\sqrt{3}}$ into polar.

$$r\sin\theta = \frac{r\cos\theta}{\sqrt{3}}$$

$$\frac{\cancel{r}\sin\theta}{\cancel{r}\cos\theta} = \frac{1}{\sqrt{3}}$$

$$\tan\theta = 1/\sqrt{3}$$

$$\boxed{\theta = \pi/6}$$