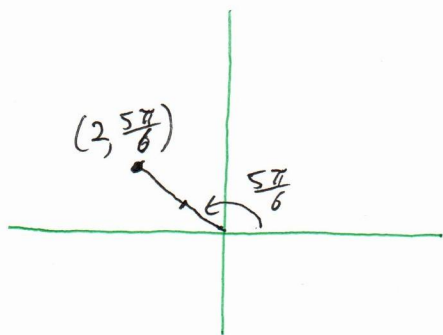


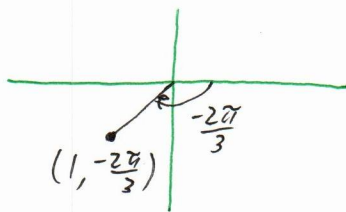
2-a)  $(2, \frac{5\pi}{6})$



$$r > 0 \quad (2, \frac{5\pi}{6} + 2\pi) = (2, \frac{17\pi}{6})$$

$$r < 0 \quad (-2, \frac{5\pi}{6} - \pi) = (-2, -\frac{\pi}{6})$$

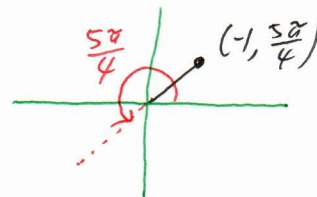
2-b)  $(1, -\frac{2\pi}{3})$



$$r > 0 \quad (1, -\frac{2\pi}{3} + 2\pi) = (1, \frac{4\pi}{3})$$

$$r < 0 \quad (-1, -\frac{2\pi}{3} + \pi) = (-1, \frac{\pi}{3})$$

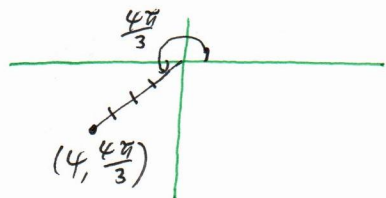
2-c)  $(-1, \frac{5\pi}{4})$



$$r > 0 \quad (1, \frac{5\pi}{4} - \pi) = (1, \frac{\pi}{4})$$

$$r < 0 \quad (-1, \frac{5\pi}{4} + 2\pi) = (-1, \frac{13\pi}{4})$$

4-a)  $(4, \frac{4\pi}{3})$



$$x = r \cos \theta = (4) \cos(\frac{4\pi}{3})$$

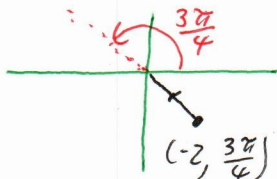
$$x = 4(-\frac{1}{2}) = -2$$

$$y = r \sin \theta = (4) \sin(\frac{4\pi}{3})$$

$$= 4(-\frac{\sqrt{3}}{2}) = -2\sqrt{3}$$

$$\underline{\underline{(-2, -2\sqrt{3})}}$$

4-b)  $(-2, \frac{3\pi}{4})$



$$x = r \cos \theta = (-2) \cos(\frac{3\pi}{4})$$

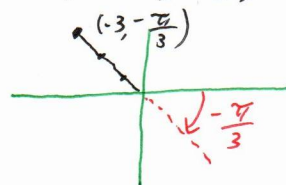
$$x = (-2)(-\frac{1}{\sqrt{2}}) = \frac{2}{\sqrt{2}} = \sqrt{2}$$

$$y = r \sin \theta = (-2) \sin(\frac{3\pi}{4})$$

$$= (-2)(\frac{1}{\sqrt{2}}) = -\frac{2}{\sqrt{2}} = -\sqrt{2}$$

$$\underline{\underline{(\sqrt{2}, -\sqrt{2})}}$$

4-c)  $(-3, -\frac{\pi}{3})$



$$x = r \cos \theta = (-3) \cos(-\frac{\pi}{3})$$

$$= (-3)(\frac{1}{2}) = -\frac{3}{2}$$

$$y = r \sin \theta = (-3) \sin(-\frac{\pi}{3})$$

$$= (-3)(-\frac{\sqrt{3}}{2}) = \frac{3\sqrt{3}}{2}$$

$$\underline{\underline{(-\frac{3}{2}, \frac{3\sqrt{3}}{2})}}$$

6-a)  $(\sqrt{3}, -1)$

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

$$r^2 = (\sqrt{3})^2 + (-1)^2$$

$$r^2 = 3 + 1 = 4$$

$$r = \pm 2$$

↓

$$r = 2$$

$$\theta = \tan^{-1}\left(\frac{y}{x}\right)$$

$$\theta = \tan^{-1}\left(\frac{-1}{\sqrt{3}}\right)$$

$$\theta = -\frac{\pi}{6}$$

$$\underline{\underline{i) (2, \frac{11\pi}{6})}}$$

$$\underline{\underline{ii) (-2, \frac{5\pi}{6})}}$$

$$6-b) (-6, 0) \quad r^2 = x^2 + y^2$$

$$r^2 = (-6)^2 + (0)^2$$

$$r^2 = 36 + 0$$

$$r^2 = 36$$

$$r = \pm 6$$

$$\downarrow$$

$$r = 6$$

$$\theta = \tan^{-1}\left(\frac{y}{x}\right)$$

$$\theta = \tan^{-1}\left(\frac{0}{-6}\right)$$

$$\theta = \tan^{-1}(0)$$

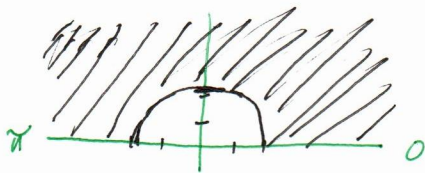
$$\theta = 0$$

$$i) \underline{(6, \pi)}$$

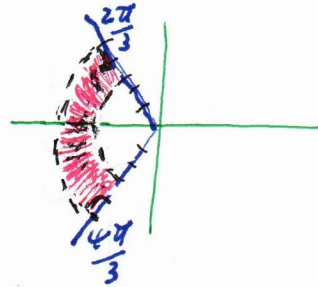
$$ii) \underline{(-6, 0)}$$

10.3/2

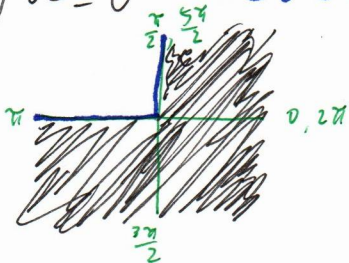
$$8) r \geq 2, \quad 0 \leq \theta \leq \pi$$



$$10) 3 < r < 5, \quad \frac{2\pi}{3} \leq \theta \leq \frac{4\pi}{3}$$



$$12) r \geq 0, \quad \frac{\pi}{2} \leq \theta \leq \frac{5\pi}{2}$$



$$16) r = 4 \sec \theta$$

$$\frac{r}{\sec \theta} = 4$$

$$r \cos \theta = 4$$

$$\underline{x = 4}$$

$$18) \theta = \frac{\pi}{3}$$

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

$$\frac{y}{x} = \frac{\sqrt{3}}{1}$$

$$\underline{y = \sqrt{3}x}$$

$$20) r^2 \sin 2\theta = 1$$

$$r^2 (2 \sin \theta \cos \theta) = 1$$

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

$$2xy = 1$$

$$xy = \frac{1}{2} \quad \text{hyperbola}$$

$$22) x = -1$$

$$r \cos \theta = -1$$

$$r = \frac{-1}{\cos \theta}$$

$$\underline{r = -\sec \theta}$$

$$24) y = -2x^2$$

10.3/3

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

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

$$r \sin \theta + 2r^2 \cos^2 \theta = 0$$

$$r(\sin \theta + 2r \cos^2 \theta) = 0$$

$$\underline{r = -\frac{1}{2} \tan \theta \sec \theta}$$

$$r = 0 \quad \sin \theta + 2r \cos^2 \theta = 0$$

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

$$r = \frac{-\sin \theta}{2 \cos^2 \theta} = -\frac{1}{2} \left( \frac{\sin \theta}{\cos \theta} \right) \left( \frac{1}{\cos \theta} \right)$$

$$r = -\frac{1}{2} \tan \theta \sec \theta$$

$$\text{when } \theta = 0 \quad r = -\frac{1}{2} \tan(0) \sec(0) = -\frac{1}{2}(0)(1)$$

$$r = 0$$

so this result include our previous result

$$26) x^2 - y^2 = 4$$

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

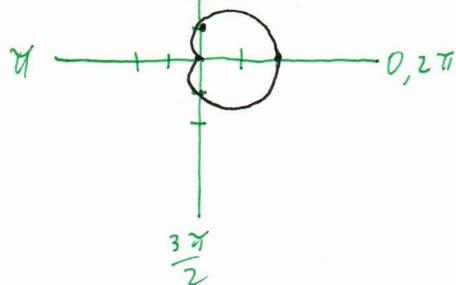
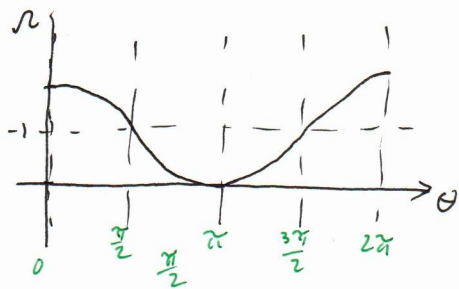
$$r^2 \cos^2 \theta - r^2 \sin^2 \theta = 4$$

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

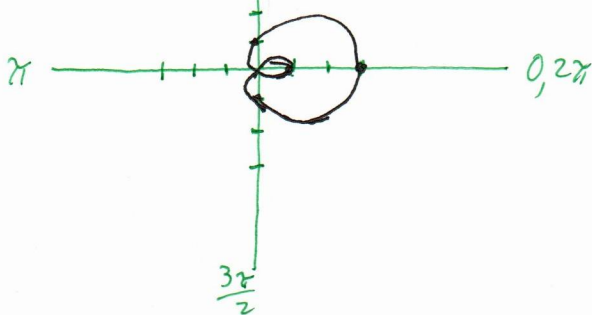
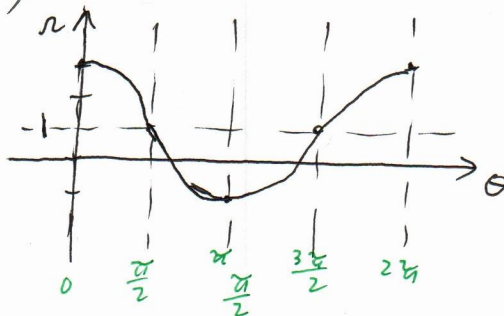
$$r^2 (\cos(2\theta)) = 4$$

$$\underline{r^2 \cos(2\theta) = 4}$$

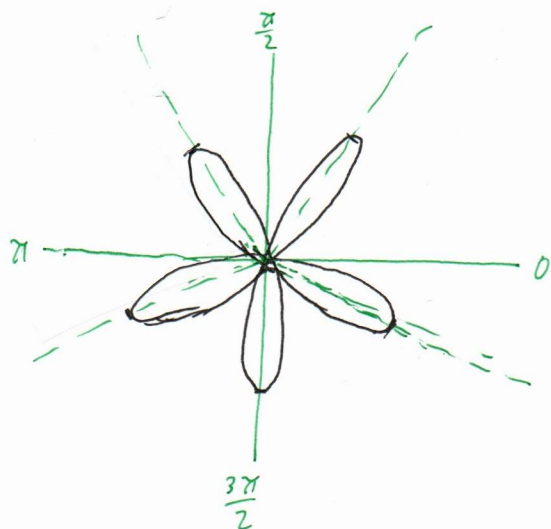
$$34) r = 1 - \cos \theta$$



$$36) r = 1 + 2 \cos \theta$$

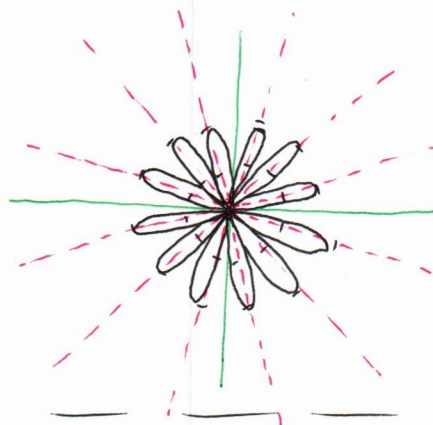


40)  $r = -\sin 5\theta$

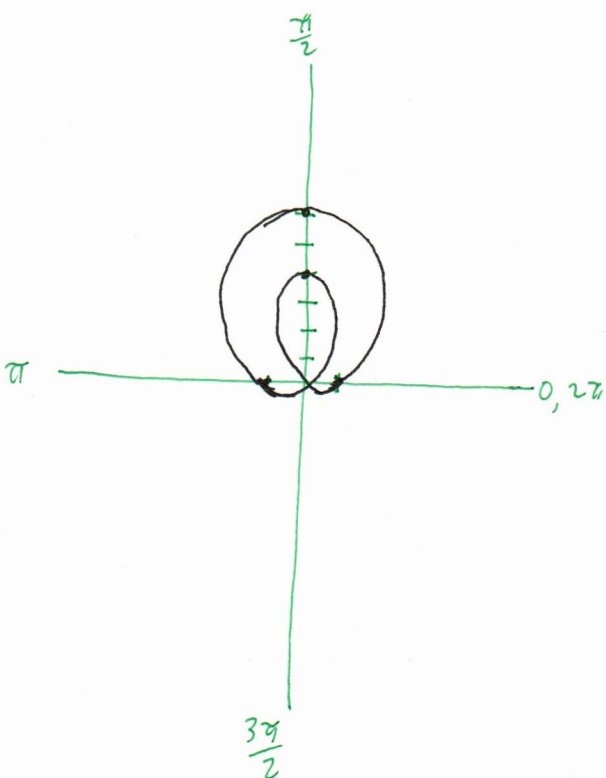
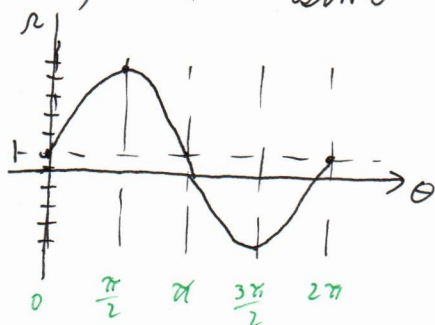


$n=5$  odd (5 petals) period  $\pi$

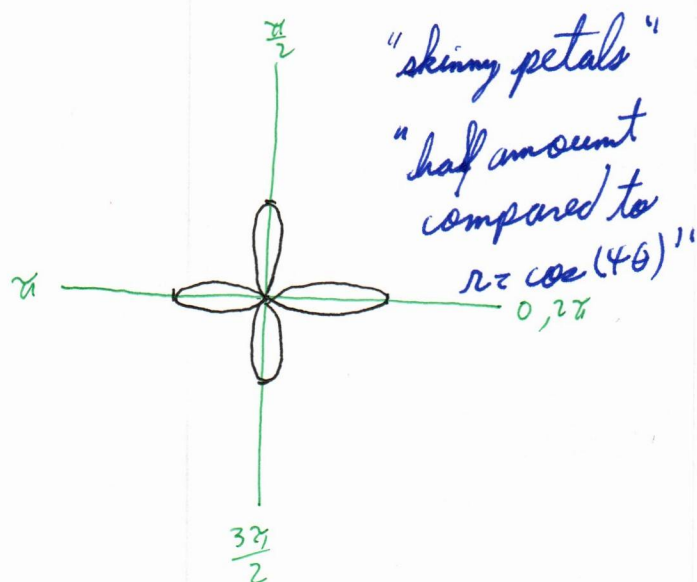
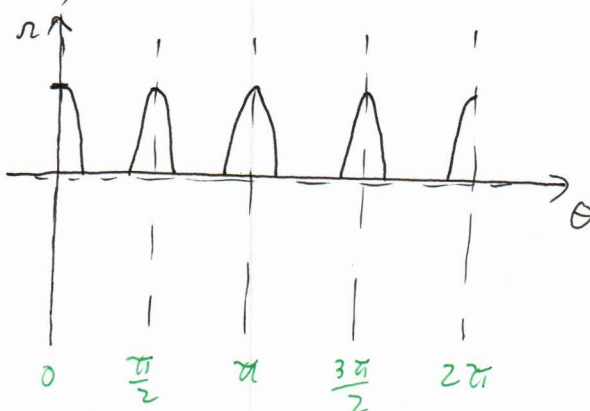
42)  $r = 2 \sin 6\theta$   $n=6$  even (12 petals) period  $2\pi$



44)  $r = 1 + 5 \sin \theta$



46)  $r^2 = \cos 4\theta$



"skinny petals"  
"half amount compared to  $r = \cos(4\theta)$ "