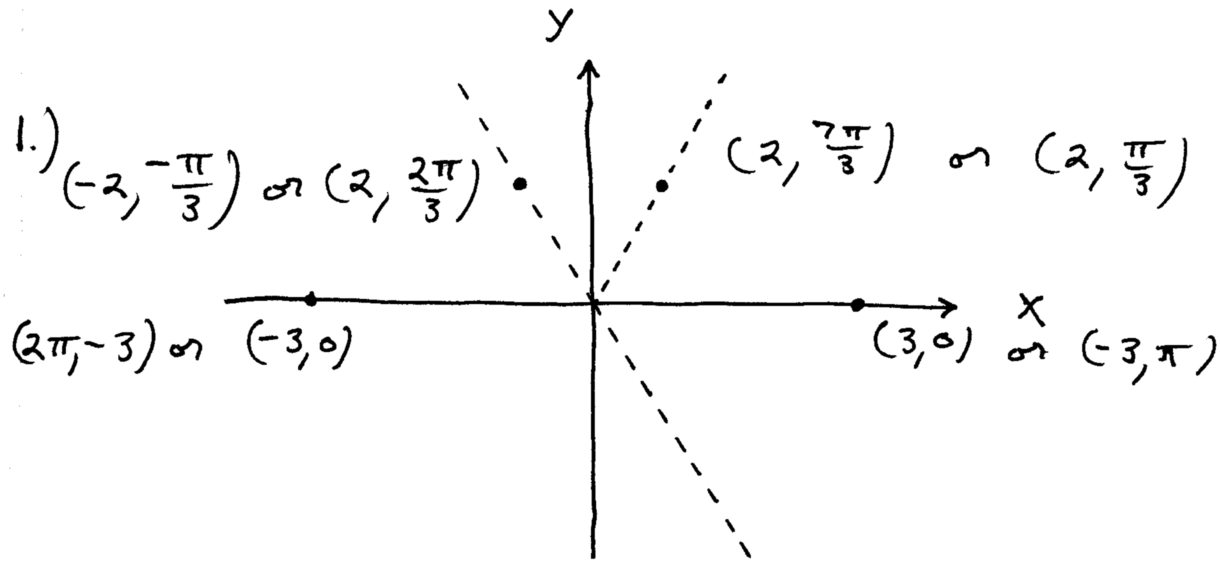
Section 11.3

1.)

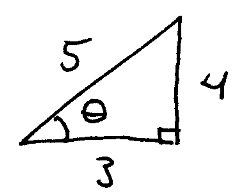


6.) d.) polar : $(-\sqrt{2}, \frac{\pi}{4}) = (r, \theta)$:

$x = r\cos\theta = -\sqrt{2}\cos\frac{\pi}{4} = -\sqrt{2}\cdot\frac{\sqrt{2}}{2} = -1$,

$y = r\sin\theta = -\sqrt{2}\sin\frac{\pi}{4} = -\sqrt{2}\cdot\frac{\sqrt{2}}{2} = -1$

f.) polar : $(5, \arctan(4/3))$
$= (r, \theta)$:



$x = r\cos\theta = 5\cdot 3/5 = 3$

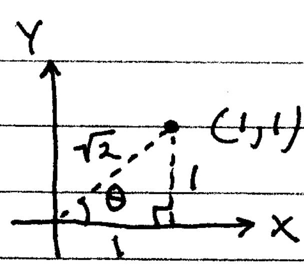
$y = r\sin\theta = 5\cdot 4/5 = 4$

h.) polar : $(2\sqrt{3}, 2\pi/3) = (r, \theta)$:

$x = r\cos\theta = 2\sqrt{3}\cos\frac{2\pi}{3} = 2\sqrt{3}\cdot\frac{-1}{2} = -\sqrt{3}$

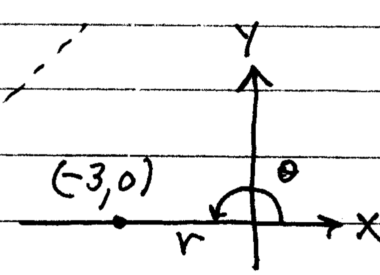
$y = r\sin\theta = 2\sqrt{3}\sin\frac{2\pi}{3} = 2\sqrt{3}\cdot\frac{\sqrt{3}}{2} = 3$

7.) a.)



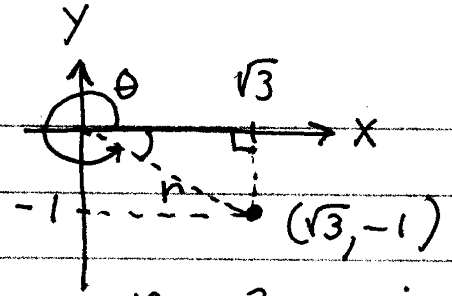
$r = \sqrt{2}$,

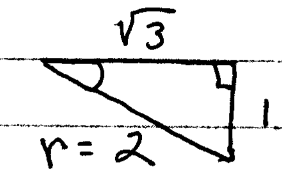
$\theta = \frac{\pi}{4}$



b.) $\theta = \pi$, $r = 3$

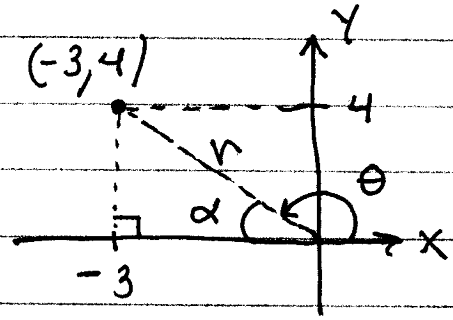
c.)

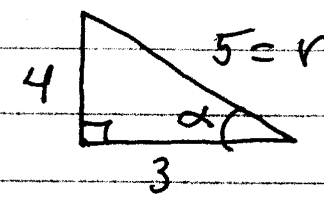




$r = 2$, $\sin\theta = -1/2$, $\cos\theta = \sqrt{3}/2$ so
$\theta = 11\pi/6$

d.)

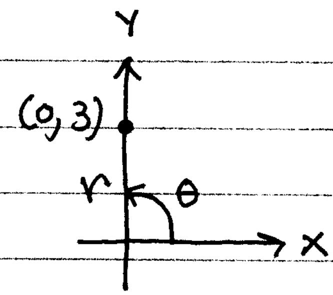




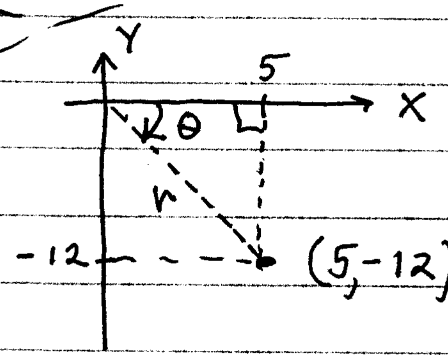
$\alpha = \arctan 4/3$ then

$\theta = \pi - \alpha = \pi - \arctan 4/3$, $r = 5$

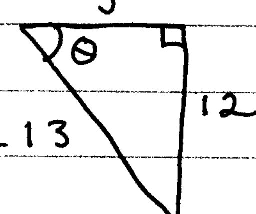
8.) b.)



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



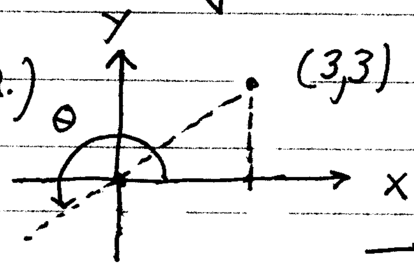
d.)

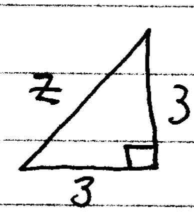


$r = 13$,

$\theta = \arctan \frac{-12}{5}$

9.) a.)





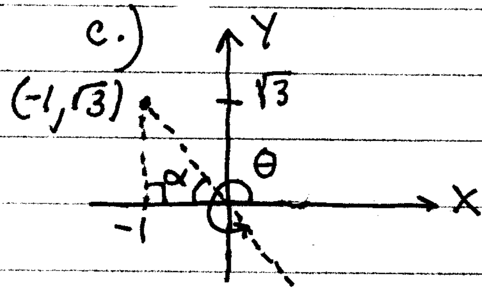
$3^2 + 3^2 = z^2$

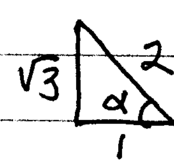
$\rightarrow z^2 = 18$

$\rightarrow z = \sqrt{18} = 3\sqrt{3}$

$\rightarrow \theta = 5\pi/4$, $r = -3\sqrt{3}$

c.)

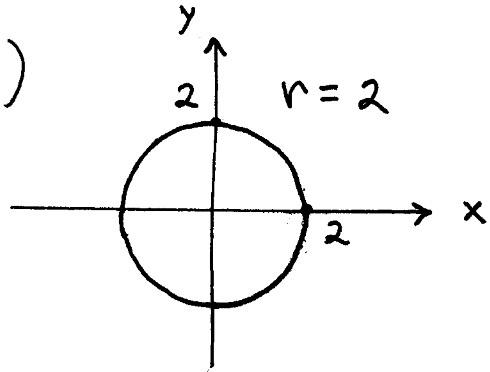




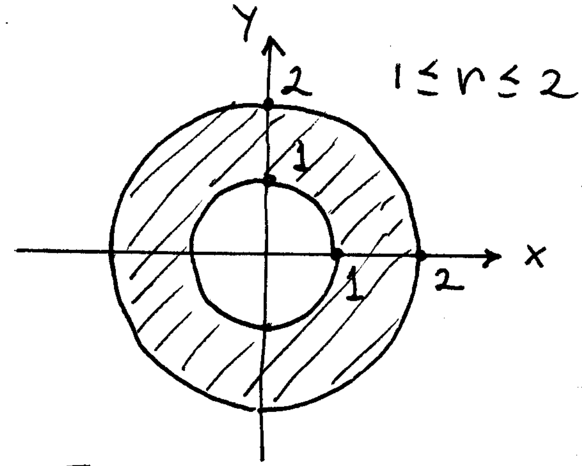
$\alpha = \pi/3$, then

$\theta = \frac{5\pi}{3}$, $r = -2$

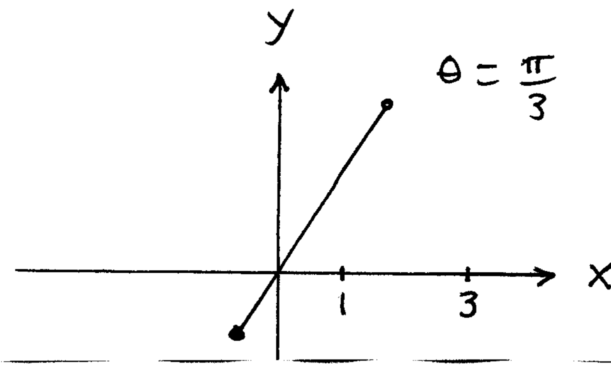
11.)



14.)



17.)



27.) $r \cos\theta = 2$

$\rightarrow x = 2$ (a vertical line)

32.) $r = -3 \sec\theta = \dfrac{-3}{\cos\theta} \rightarrow$

$r\cos\theta = -3$

$\rightarrow X = -3$ (a vertical line)

36.) $r^2 = 4r \sin\theta \rightarrow$

$X^2 + Y^2 = 4Y \rightarrow$

$X^2 + Y^2 - 4Y + 4 = 4 \rightarrow$

$X^2 + (Y-2)^2 = 2^2$

(circle : center $(0,2)$, radius $= 2$)

38.) $r^2 \sin 2\theta = 2 \rightarrow$

$r^2 \cdot 2 \sin\theta \cos\theta = 2 \rightarrow$

$r\cos\theta \cdot r\sin\theta = 1 \rightarrow$

$XY = 1 \rightarrow Y = 1/X$ (hyperbola)

47.) $r = 8\sin\theta \rightarrow$

$r^2 = 8r\sin\theta \rightarrow$

$x^2 + y^2 = 8y \rightarrow$

$x^2 + y^2 - 8y + 16 = 16 \rightarrow$

$x^2 + (y-4)^2 = 4^2$

(circle : center $(0,4)$, radius $= 4$)

53.) $x = 7 \rightarrow r\cos\theta = 7 \rightarrow r = \frac{7}{\cos\theta}$

$\rightarrow r = 7\sec\theta$

54.) $y = 1 \rightarrow r\sin\theta = 1 \rightarrow r = \frac{1}{\sin\theta}$

$\rightarrow r = \csc\theta$

55.) $x = y \rightarrow r\cos\theta = r\sin\theta \rightarrow \cos\theta = \sin\theta$

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

56.) $x - y = 3 \rightarrow r\cos\theta - r\sin\theta = 3$

$\rightarrow r(\cos\theta - \sin\theta) = 3 \rightarrow r = \frac{3}{\cos\theta - \sin\theta}$

57.) $x^2+y^2=4 \rightarrow r^2=4 \rightarrow r=2$

61.) $y^2=4x \rightarrow (r\sin\theta)^2=4r\cos\theta \rightarrow$

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

$r=\dfrac{4\cos\theta}{\sin^2\theta} \rightarrow r=4\csc\theta\cot\theta$

62.) $x^2+xy+y^2=1 \rightarrow (x^2+y^2)+xy=1 \rightarrow$

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

$r^2+r^2\sin\theta\cos\theta=1 \rightarrow$

$r^2(1+\sin\theta\cos\theta)=1 \rightarrow r^2=\dfrac{1}{1+\sin\theta\cos\theta}$

63.) $x^2+(y-2)^2=4 \rightarrow x^2+y^2-4y+4=4 \rightarrow$

$r^2-4r\sin\theta=0 \rightarrow r(r-4\sin\theta)=0 \rightarrow$

$\cancel{r=0}$ or $r-4\sin\theta=0 \rightarrow r=4\sin\theta$

66.) $(x+2)^2+(y-5)^2=16 \rightarrow$

$(r\cos\theta+2)^2+(r\sin\theta-5)^2=16 \rightarrow$

$r^2\cos^2\theta+4r\cos\theta+4$

$+r^2\sin^2\theta-10r\sin\theta+25=16 \rightarrow$

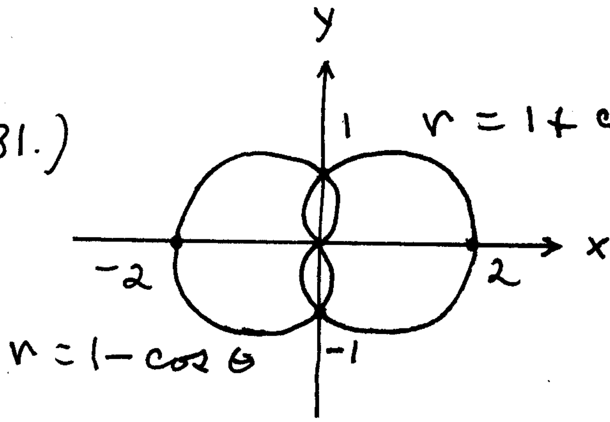
$r^2(\cos^2\theta+\sin^2\theta)+4r\cos\theta$

$-10r\sin\theta = -13 \rightarrow$

$r^2+r(4\cos\theta-10\sin\theta)=-13$

~~The following problems are from edition 11~~

31.)



$1 + \cos\theta = 1 - \cos\theta$

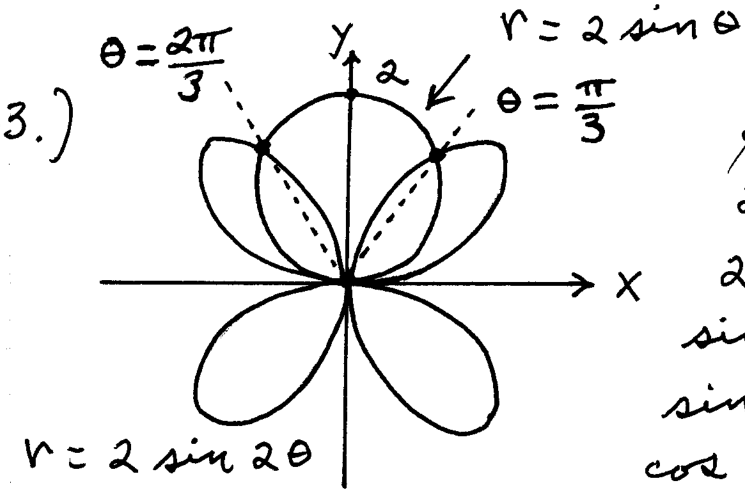
$\rightarrow \quad 0 = 2\cos\theta$

$\rightarrow \quad \cos\theta = 0$

$\rightarrow \quad \theta = \frac{\pi}{2}, \ \frac{3\pi}{2}$;

pts. of $\cap$ are $\left(1, \frac{\pi}{2}\right)$, $\left(1, \frac{3\pi}{2}\right)$, and $(0,0)$

33.)



$\cancel{2}\sin 2\theta = \cancel{2}\sin\theta \rightarrow$

$2\sin\theta\cos\theta = \sin\theta \rightarrow$

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

$\sin\theta(2\cos\theta - 1) = 0 \rightarrow$

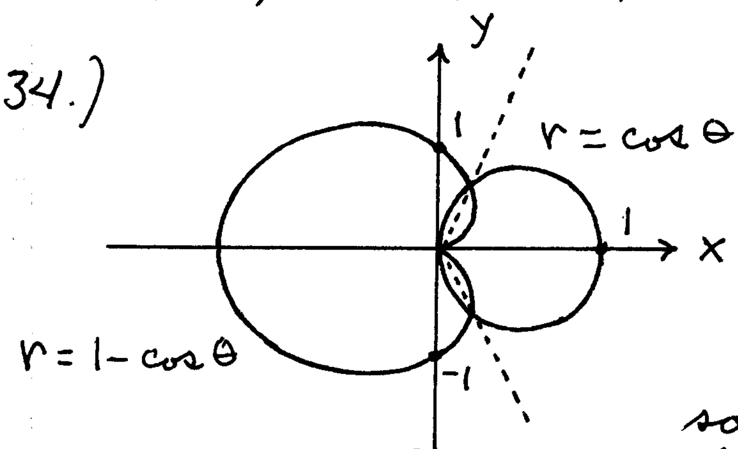
$\sin\theta = 0 \rightarrow \theta = 0$ or

$\cos\theta = \frac{1}{2} \rightarrow \theta = \frac{\pi}{3}$;

so pts. of $\cap$ are

$(0,0)$, $(\sqrt{3}, \frac{\pi}{3})$, $(\sqrt{3}, \frac{2\pi}{3})$

34.)



$\cos\theta = 1 - \cos\theta \rightarrow$

$2\cos\theta = 1 \rightarrow$

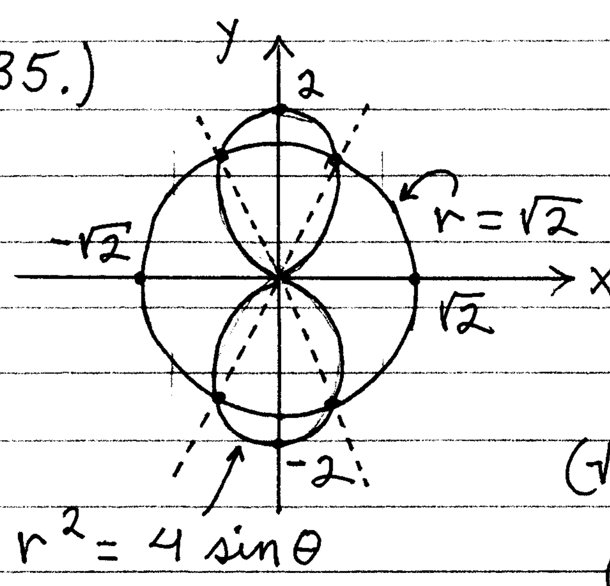
$\cos\theta = 1/2 \rightarrow$

$\theta = \frac{\pi}{3}$ or $-\frac{\pi}{3}$;

so pts. of $\cap$ are

$(0,0)$, $(1/2, \pi/3)$, $(1/2, -\pi/3)$

35.)



$4\sin\theta = (\sqrt{2})^2 \rightarrow$

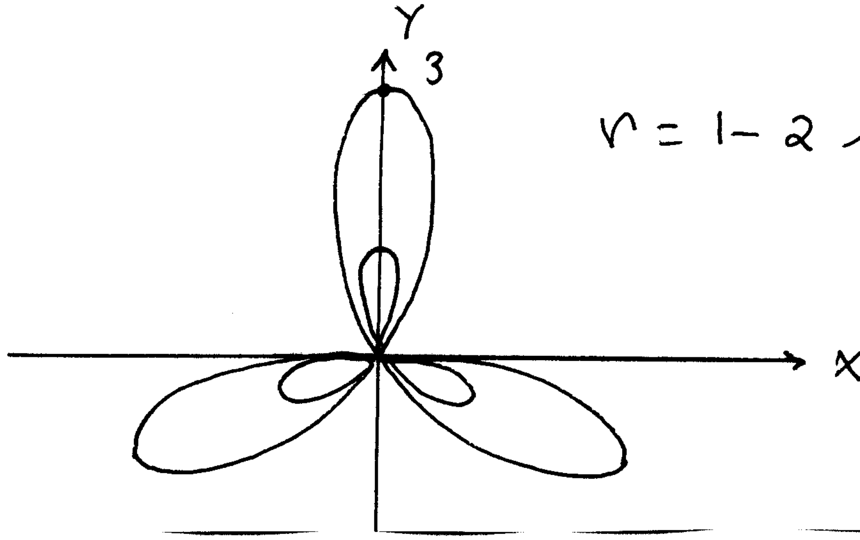
$\sin\theta = \frac{2}{4} = \frac{1}{2} \rightarrow$

$\theta = \frac{\pi}{3}, \frac{2\pi}{3}$; so points of $\cap$ are

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

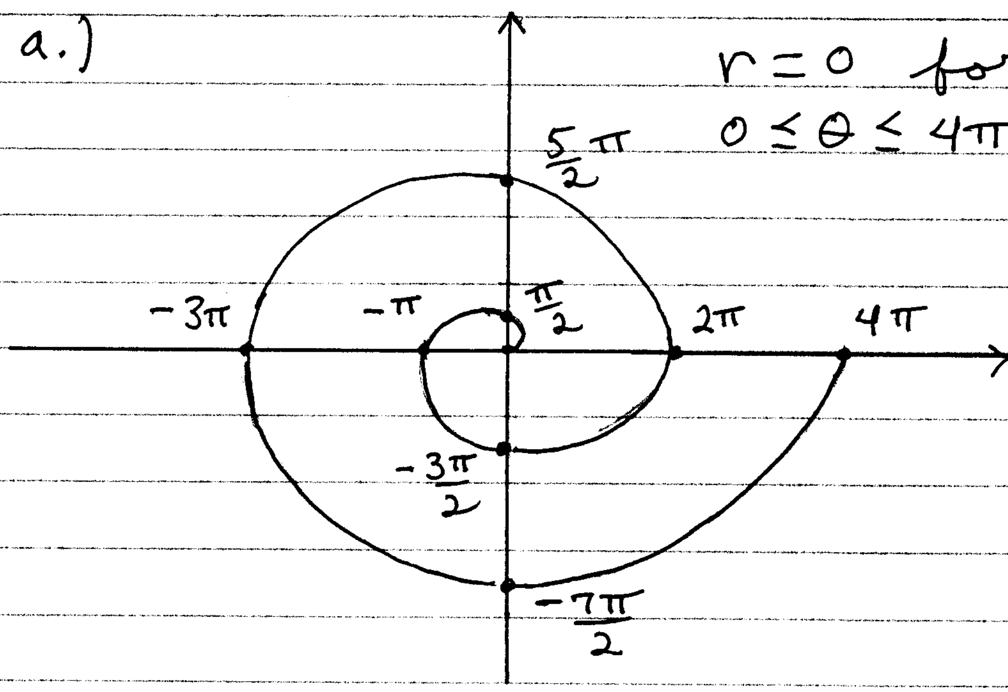
$(\sqrt{2}, -\frac{2\pi}{3})$

45.)



$r = 1 - 2\sin 3\theta$

47.) a.)



$r = 0$ for
$0 \le \theta \le 4\pi$

c.)

$r = e^{\theta/10}$

for $0 \leq \theta \leq 4\pi$