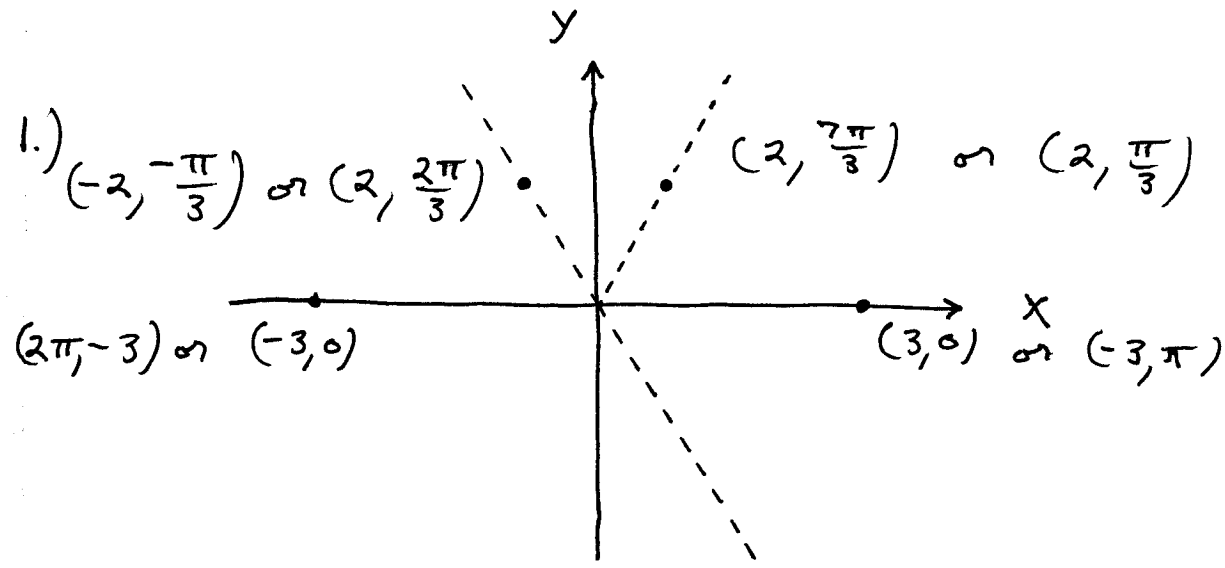
Section 11.3

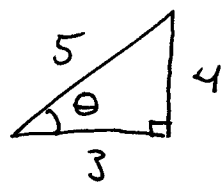


6.) d.) polar: $(-\sqrt{2}, \frac{\pi}{4}) = (r, \theta)$:

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

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

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



$$x = r\cos\theta = 5\cdot\tfrac{3}{5} = 3$$

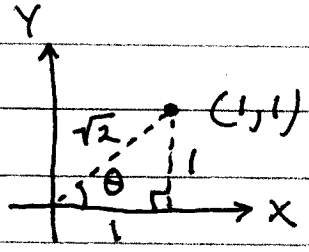
$$y = r\sin\theta = 5\cdot\tfrac{4}{5} = 4$$

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

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

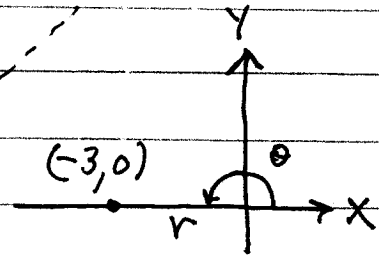
$$y = r\sin\theta = 2\sqrt{3}\sin\frac{2\pi}{3} = 2\sqrt{3}\cdot\frac{\sqrt{3}}{2} = 3$$

7.) a.)



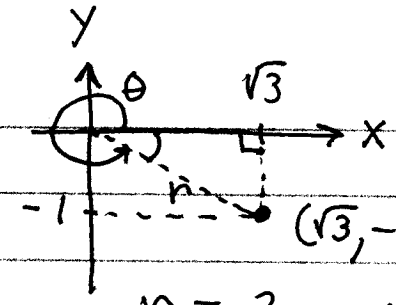
$r = \sqrt{2}$,

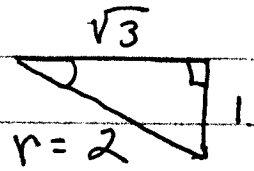
$\theta = \frac{\pi}{4}$



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

c.)

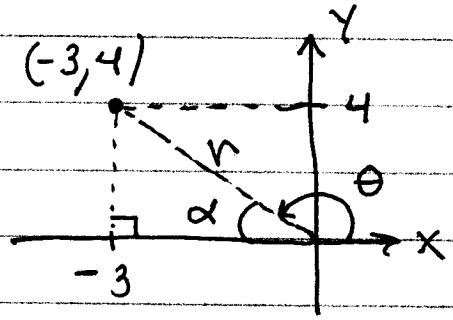


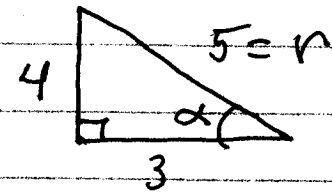


$r = 2$, $\sin\theta = -1/2$, $\cos\theta = \sqrt{3}/2$ so

$\theta = 11\pi/6$

d.) $(-3, 4)$

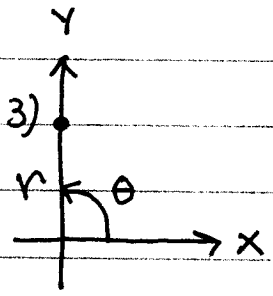




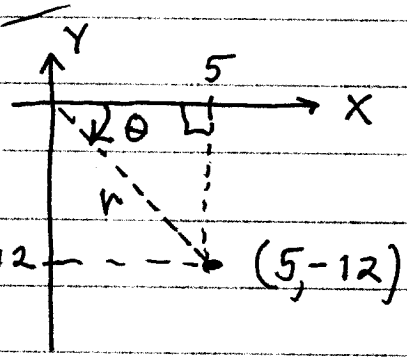
$\alpha = \arctan 4/3$ then

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

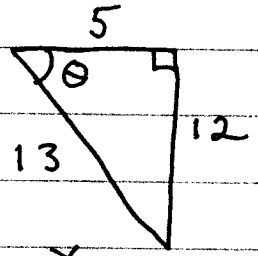
8.) b.) $(0, 3)$



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



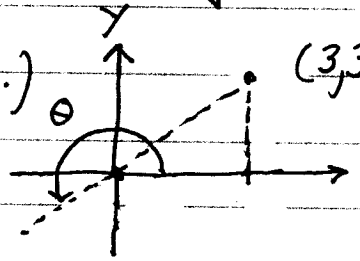
d.)

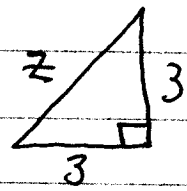


$r = 13$,

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

9.) a.)





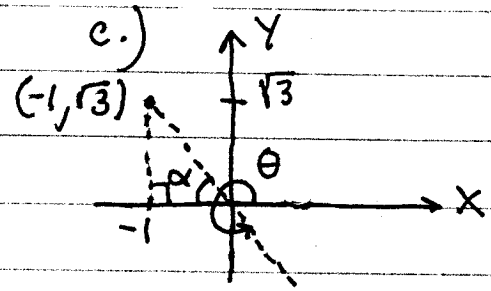
$3^2 + 3^2 = z^2$

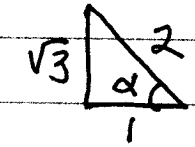
$\rightarrow z^2 = 18$

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

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

c.)

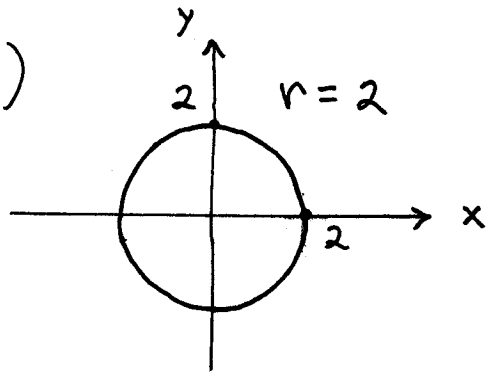




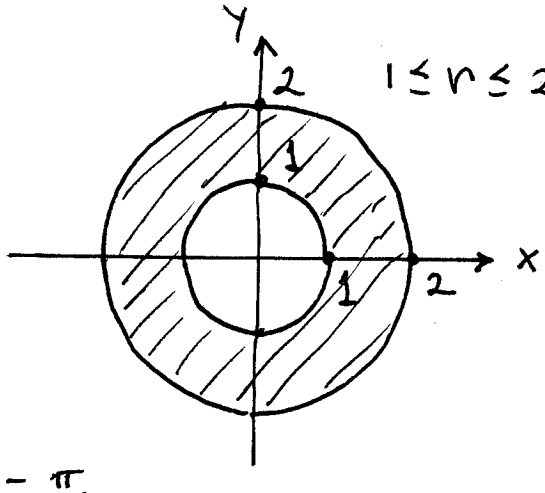
$\alpha = \pi/3$, then

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

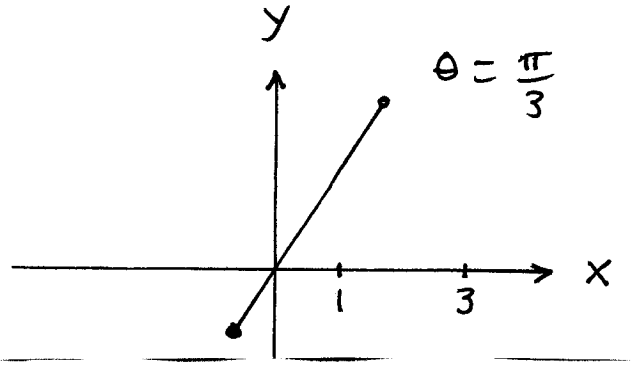
11.)



14.)



17.)



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

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

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

$r\cos\theta = -3$

$\rightarrow x = -3$ (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.) $r^2\sin 2\theta = 2 \rightarrow$

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

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

$xy = 1 \rightarrow y = \frac{1}{x}$ (hyperbola)

40.) $r = 4\tan\theta\sec\theta \rightarrow$

$r = 4 \cdot \frac{\sin\theta}{\cos\theta} \cdot \frac{1}{\cos\theta} \rightarrow$

$r\cos\theta \cdot \cos\theta = 4\sin\theta \rightarrow$

$r\cos\theta \cdot r\cos\theta = 4r\sin\theta \rightarrow$

$x \cdot x = 4y \rightarrow 4y = x^2$ (parabola)

42.) $r\sin\theta = \ln r + \ln\cos\theta \rightarrow$

$r\sin\theta = \ln(r\cos\theta) \rightarrow$

$y = \ln x$

44.) $\cos^2\theta = \sin^2\theta \rightarrow r^2\cos^2\theta = r^2\sin^2\theta$

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

$y = \pm x$ (crossing lines)

49.) $r = 2\cos\theta + 2\sin\theta \rightarrow$

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

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

$(x^2 - 2x + 1) + (y^2 - 2y + 1) = 0 + 1 + 1 \rightarrow$

$(x-1)^2 + (y-1)^2 = (\sqrt{2})^2$ (circle of radius $\sqrt{2}$ centered at $(1,1)$)

52.) $r\sin\left(\frac{2\pi}{3} - \theta\right) = 5 \rightarrow$

$r\left[\sin\frac{2\pi}{3}\cos\theta - \cos\frac{2\pi}{3}\sin\theta\right] = 5 \rightarrow$

$\frac{\sqrt{3}}{2} \cdot r\cos\theta + \frac{1}{2} \cdot r\sin\theta = 5 \rightarrow$

$\frac{\sqrt{3}}{2}y + \frac{1}{2}x = 5$ (line)

47.) on next page

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

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

$r \neq 0$ or $r - 4\sin\theta = 0 \rightarrow r = 4\sin\theta$

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

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

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

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

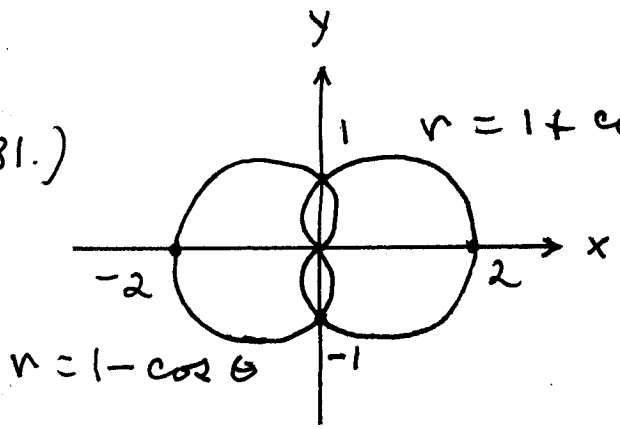
$r^2(\cos^2\theta + \sin^2\theta) + 4r\cos\theta$

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

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

The following problems are from edition 11

31.)



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

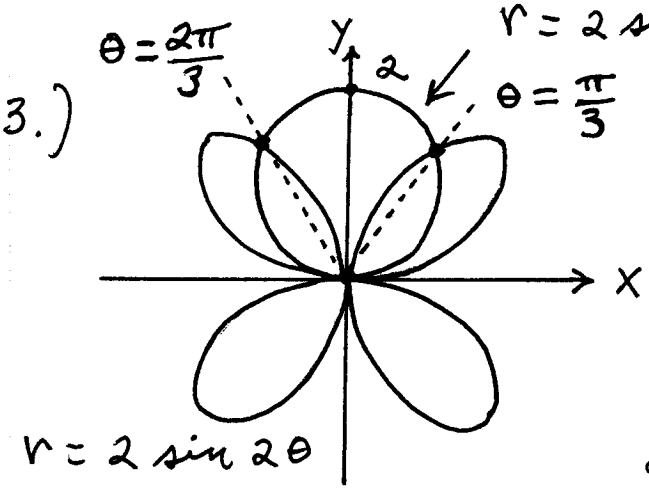
$\rightarrow \quad 0 = 2\cos\theta$

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

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

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

33.)



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

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

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

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

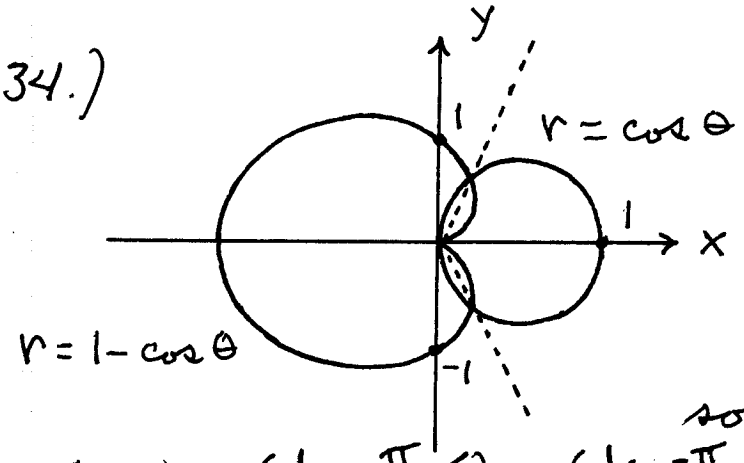
$\sin\theta = 0 \rightarrow \theta = 0$ or

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

so pts. of $\cap$ are

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

34.)



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

$2\cos\theta = 1 \rightarrow$

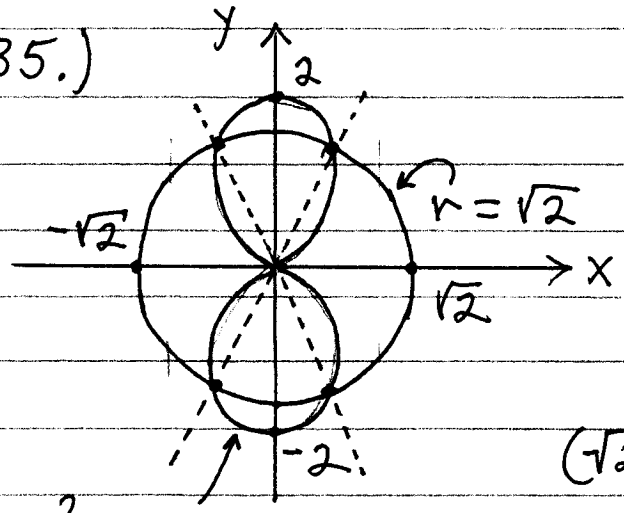
$\cos\theta = 1/2 \rightarrow$

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

so pts. of $\cap$ are

$(0,0)$, $\left(\frac{1}{2}, \frac{\pi}{3}\right)$, $\left(\frac{1}{2}, \frac{-\pi}{3}\right)$

35.)



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

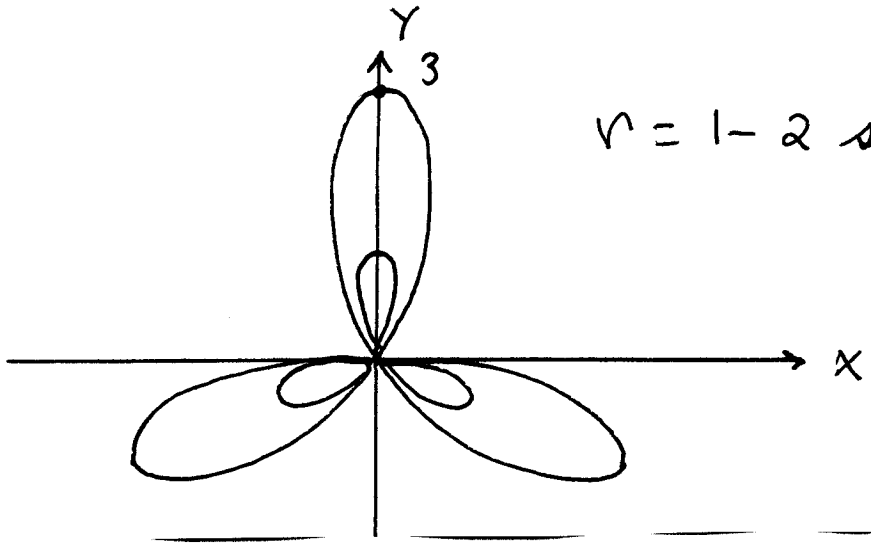
$\sin\theta = \frac{2}{4} = \frac{1}{2} \rightarrow$

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

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

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

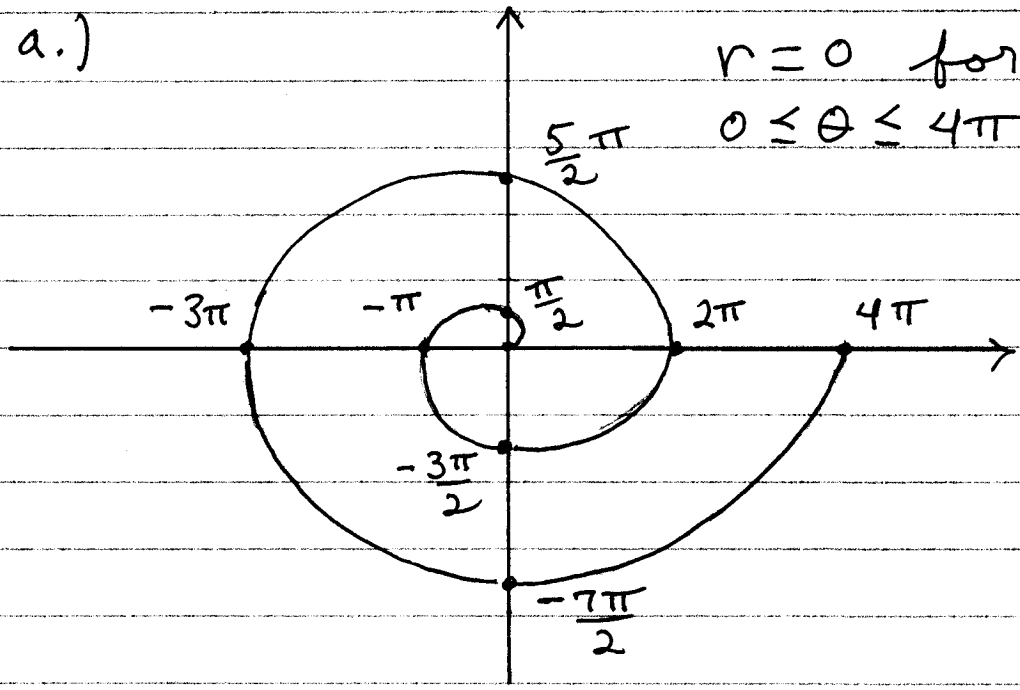
45.)



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

47.) a.)

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



c.)

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

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