Polar Coordinates Key

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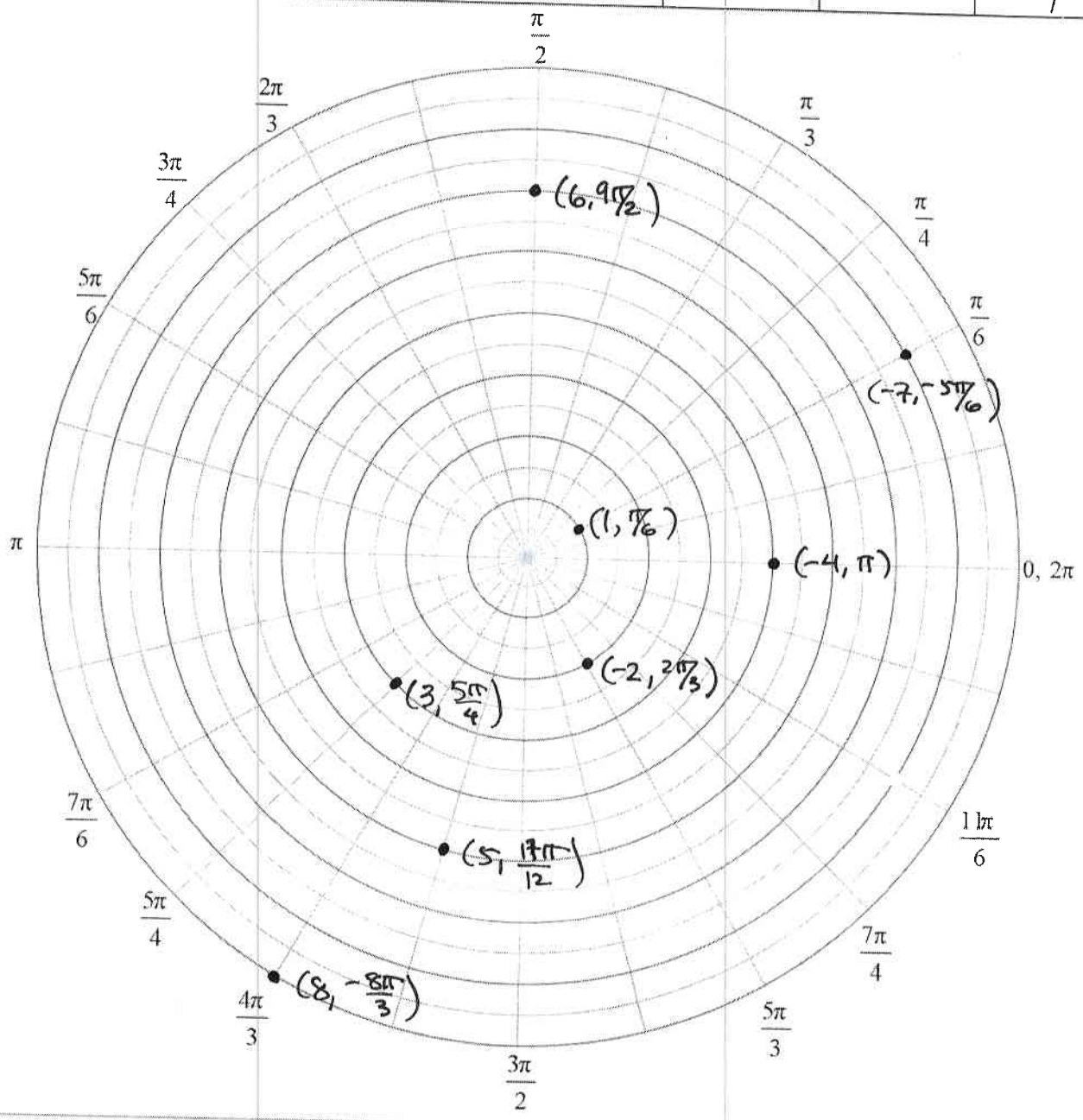
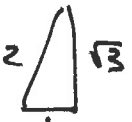


ii) $x = r\cos\theta = 1\cos\pi/6 = \frac{\sqrt{3}}{2}$ $\quad y = r\sin\theta = 1\cdot\sin\pi/6 = 1/2$

$\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right) \Leftrightarrow (1, \pi/6)$



$(-2, 2\pi/3)$ $\quad x = -2\cos 2\pi/3 = -2(-\frac{1}{2}) = 1$

$y = -2\sin 2\pi/3 = -2(\sqrt{3}/2) = -\sqrt{3} \Leftrightarrow (1, -\sqrt{3})$

$(3, 5\pi/4)$ $\quad x = 3\cos 5\pi/4 = 3\cdot -1/\sqrt{2} = -3/\sqrt{2}$

$y = 3\sin 5\pi/4 = 3\cdot -1/\sqrt{2} = -3/\sqrt{2} \Rightarrow (-3/\sqrt{2}, -3/\sqrt{2})$

$(-4, \pi) \Rightarrow$ $\quad x = -4\cos\pi = -4(-1) = 4$

$y = -4\sin\pi = -4(0) = 0 \Rightarrow (4, 0)$

$\left(5, \frac{17\pi}{12}\right)$ $\quad x = 5\cos 17\pi/12 \approx 5(-.2588) = -1.294$

$y = 5\sin 17\pi/12 \approx 5(-.9659) = -4.830 \Rightarrow (-1.294, -4.830)$

$(6, 9\pi/2)$ $\quad x = 6\cos 9\pi/2 = 6(0) = 0$

$y = 6\sin 9\pi/2 = 6(1) = 6 \Rightarrow (0, 6)$

$(-7, -5\pi/6)$ $\quad x = -7\cos -5\pi/6 = -7(-\frac{\sqrt{3}}{2}) = \frac{7\sqrt{3}}{2}$

$y = -7\sin -5\pi/6 = -7(-1/2) = 7/2 \Rightarrow \left(\frac{7\sqrt{3}}{2}, 7/2\right)$

$(8, -8\pi/3)$ $\quad x = 8\cos -8\pi/3 = 8(-1/2) = -4$

$y = 8\sin(-8\pi/3) = 8(-\sqrt{3}/2) = -4\sqrt{3} \Rightarrow (-4, -4\sqrt{3})$

iii) $(-1, 2)$ $\quad r = \sqrt{(1)^2 + 2^2} = \sqrt{5}$ $\quad \theta = \tan^{-1}(y/x) + \pi = 2.034$

QII $\quad \approx (\sqrt{5}, 2.034)$

$(-3, -3)$ $\quad r = \sqrt{(-3)^2 + (-3)^2} = \sqrt{18} = 3\sqrt{2}$ $\quad \theta = \tan^{-1}(1) + \pi = 5\pi/4$

QIII $\quad (3\sqrt{2}, 5\pi/4)$

$(4, 1/2)$ $\quad r = \sqrt{16 + 1/4} = \frac{\sqrt{65}}{2}$ $\quad \theta = \tan^{-1}(1/8) \approx .124$

QI $\quad \approx \left(\frac{\sqrt{65}}{2}, .124\right)$

iii. continued

$(\sqrt{5}, -\sqrt{17})$ $r = \sqrt{5+17} = \sqrt{22}$ $\theta = \tan^{-1}\left(\frac{-\sqrt{17}}{\sqrt{5}}\right) \approx -.690$

QIV $\approx (\sqrt{22}, -.690)$ or $(\sqrt{22}, 5.593)$

$(\sqrt{3}, 1)$ $r = \sqrt{3+1} = \sqrt{4} = 2$ $\theta = \tan^{-1}(1/\sqrt{3}) = \pi/6$

QI $(2, \pi/6)$

$(-4, -5)$ $r = \sqrt{16+25} = \sqrt{41}$ $\theta = \tan^{-1}\left(\frac{-5}{-4}\right) + \pi \approx 4.038$

QIII $\approx (\sqrt{41}, 4.038)$

$(-10, 11)$ $r = \sqrt{100+121} = \sqrt{221}$ $\theta = \tan^{-1}\left(\frac{11}{-10}\right) + \pi \approx 2.309$

QII $\approx (\sqrt{221}, 2.309)$

$\left(\frac{5}{3}, -\frac{9}{2}\right)$ $r = \sqrt{\frac{25}{9} + \frac{81}{4}} = \sqrt{\frac{829}{36}} = \frac{\sqrt{829}}{6}$ $\theta = \tan^{-1}\left(-\frac{9}{2} \cdot \frac{3}{5}\right) \approx -1.216$

QIV $\approx \left(\frac{\sqrt{829}}{6}, -1.216\right)$ or $\left(\frac{\sqrt{829}}{6}, 5.067\right)$

iv. a. $x^2 + y^2 = 4x + 6y \Rightarrow$

$\frac{r^2 = 4r\cos\theta + 6r\sin\theta}{r} \Rightarrow r = 4\cos\theta + 6\sin\theta$

b. $y = -5x \Rightarrow \frac{r\sin\theta = -5r\cos\theta}{r} \Rightarrow \frac{\sin\theta}{\cos\theta} = -5\frac{\cos\theta}{\cos\theta} \Rightarrow$

$\tan\theta = -5 \Rightarrow \theta = \tan^{-1}(-5)$

c. $x^2 + y - 2 = 0$ $r^2\cos^2\theta + r\sin\theta - 2 = 0$

d. $x = 4 \Rightarrow r\cos\theta = 4 \Rightarrow r = 4\sec\theta$

e. $(x-2)^2 + (y+3)^2 = 16 \Rightarrow (r\cos\theta - 2)^2 + (r\sin\theta + 3)^2 = 16$

v. f. $r = -2\sin\theta$)$*r \Rightarrow r^2 = -2r\sin\theta \Rightarrow x^2 + y^2 = -2y$

$x^2 + y^2 + 2y + 1 = 1 \Rightarrow x^2 + (y+1)^2 = 1$

v. g. $r = 3 + \sin\theta \Rightarrow r^2 = 3r + r\sin\theta \Rightarrow$

$x^2 + y^2 = 3\sqrt{x^2+y^2} + y$

h. $r = 6\sin(2\theta) \Rightarrow r^3 = 6r^2 \cdot 2\sin\theta\cos\theta \Rightarrow$

$r^3 = 12\, r\sin\theta \cdot r\cos\theta \Rightarrow (x^2+y^2)^{3/2} = 12xy$

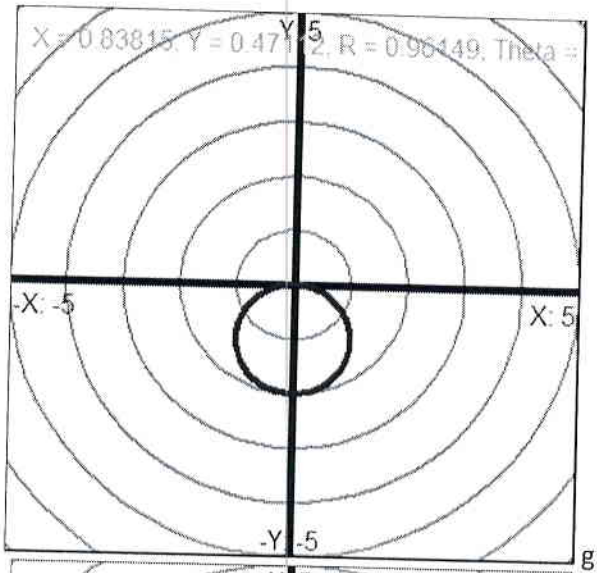
i. $\theta = \pi/2 \Rightarrow x = 0$

j. $r = 3 \Rightarrow x^2 + y^2 = 9$

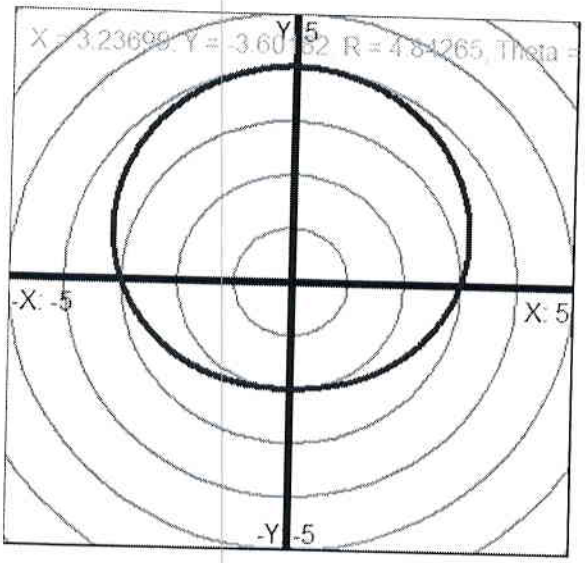
k. $r = -5\csc\theta \Rightarrow r\sin\theta = -5 \Rightarrow y = -5$

vi. see attached page.

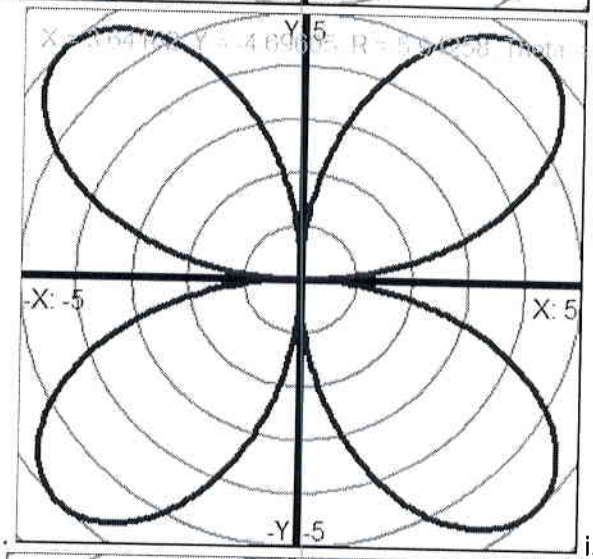
f.



g.

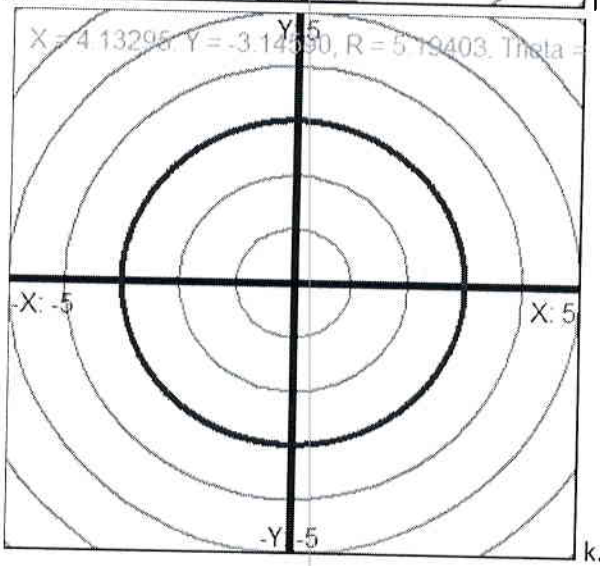


h.



i. Vertical line at x=0

j.



k.