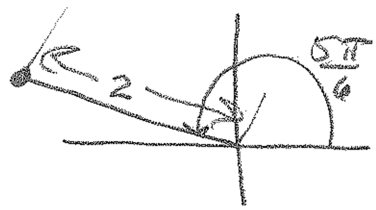
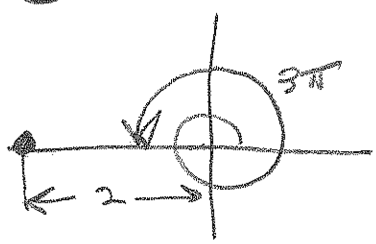
122 §6.7 #s 5, 9, 13, 17, 21, 25, 29, 33, 43, 47, 51, 55, 59, 71, 75, 79, 83, 87, 91, 95, 99, 103, 107, 111, 117, 119, 121, 123

#s 5-18 Plot & find two additional polar representations

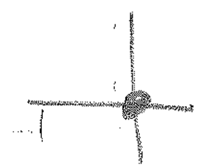
(5) $\left(2, \frac{5\pi}{6}\right) = \left(-2, \frac{11\pi}{6}\right) = \left(2, \frac{17\pi}{6}\right)$



(9) $(2, 3\pi) = (-2, 0) = (2, 5\pi)$

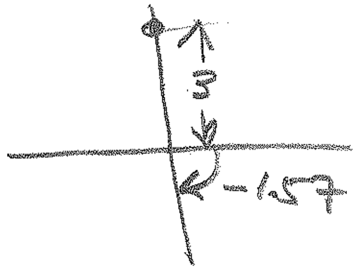


(13) $\left(0, -\frac{7\pi}{6}\right) = (0, \text{ANY}) = (0, \text{OTHER})$



(17) $(-3, -1.57) = (3, 1.57) = (3, 1.57 + 2\pi)$

$\approx (3, 7.85)$



122 § 6.7 #s 21, 25, ...

#s 19–34 Convert to rect. coords

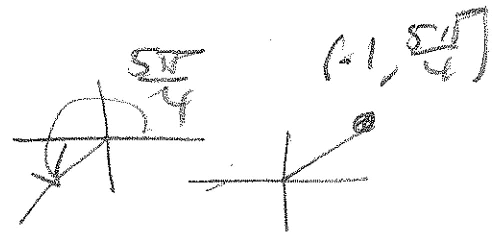
21 $\left(3, \frac{\pi}{2}\right)$

$x = r\cos\theta$ $\qquad$ $y = r\sin\theta$

$= 3\cos\frac{\pi}{2}$ $\qquad$ $= 3\sin\frac{\pi}{2}$

$= 0 = x$ $\qquad$ $= 3 = y$

$\boxed{(0, 3)}$



25 $\left(-1, \frac{5\pi}{4}\right)$

$x = r\cos\theta$ $\qquad$ $y = r\sin\theta$

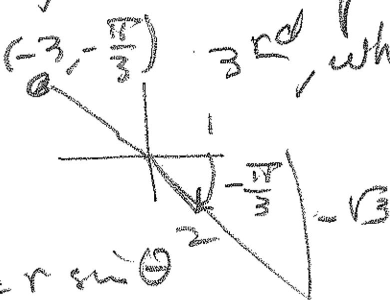
$= (-1)\cos\frac{5\pi}{4}$ $\qquad$ $= (-1)\sin\frac{5\pi}{4}$

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

$= \frac{1}{\sqrt{2}} = x$ $\qquad$ $= \frac{1}{\sqrt{2}} = y$

$\boxed{\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)}$

$r < 0$ puts it in 1st quadrant from 3rd, where $\frac{5\pi}{4}$ puts it.



29 $\left(-3, -\frac{\pi}{3}\right)$

$x = r\cos\theta$ $\qquad$ $y = r\sin\theta$

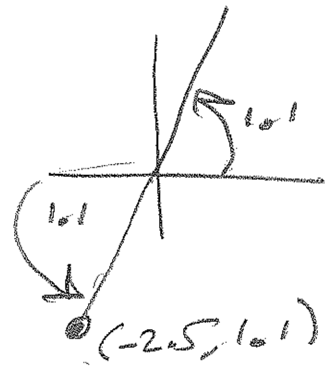
$= (-3)\cos\left(-\frac{\pi}{3}\right)$ $\qquad$ $= (-3)\sin\left(-\frac{\pi}{3}\right)$

$= (-3)\left(\frac{1}{2}\right) = -\frac{3}{2} = x$ $\qquad$ $= (-3)\left(-\frac{\sqrt{3}}{2}\right) = \frac{3\sqrt{3}}{2} = y$

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

122 §6.7 #s 33, 43, 47, 51, ...

33 $(-2.5, 1.1)$ $\quad 1.1 \approx 63.025^\circ$



$x = r\cos\theta$

$= (-2.5)\cos(1.1)$

$\approx (-2.5)(.4535961214)$

$\approx -1.13399030 4 \approx x$

$\boxed{(-1.13399, -2.22802)}$

$y = r\sin\theta$

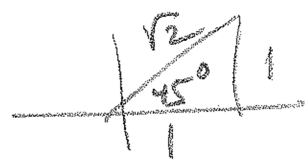
$= (-2.5)\sin(1.1)$

$\approx (-2.5)(.8912073601)$

$\approx -2.2280184 \approx y$

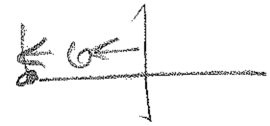
#s 43-60 Convert to Polar Coords

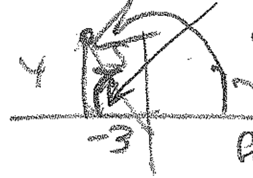
43 $(1,1) = \boxed{\left(\sqrt{2}, \frac{\pi}{4}\right)}$



47 $(-6, 0) = \boxed{(6, \pi)}$ OR $(-6, 0)$!

x y r θ





Ref angle approx .9273. → 2.2143 radians for desired ref. angle.

51 $(-3, 4) \approx \boxed{(5, 2.214297)}$

$\arctan\left(-\frac{4}{3}\right) \approx -.927295218$

arctangent sees this.

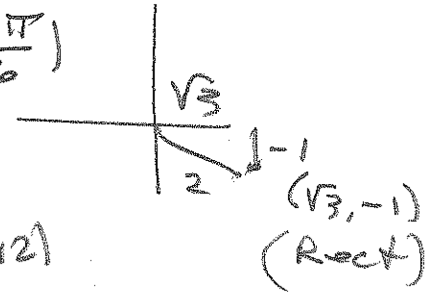
Want $\pi - .927295218$

≈ 2.214297436

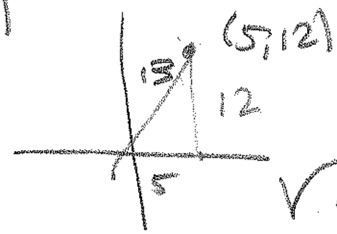
Want that same reference angle, but it needs to be in Q II

122 §6.7 #s 55, 59, 71, 75, 79, 83 —

(55) $(\sqrt{3},-1) = \boxed{\left(2,-\frac{\pi}{6}\right)}$ OR $\left(2,\frac{11\pi}{6}\right)$



(59) $(5,12) \approx (13, 1.1760)$



$\sqrt{144+25} = \sqrt{169} = 13$

$\arctan\left(\frac{y}{x}\right) =$

$= \tan^{-1}\left(\frac{12}{5}\right) =$

$\approx 67.38013505^{\circ}$

≈ 1.176005207 radians

#s 71–90 Convert rectangular eq'n to polar form

(71) $x^2+y^2=9$

$r^2=9$

$r=\pm 3$

$r=3$ is circle of radius 3. So is $r=-3$, just inscribed in opposite direction, so $\boxed{r=3}$ covers it.

(75) $x=10$

$\boxed{r\cos\theta = 10}$ OR $\boxed{r = 10\sec\theta}$ Book gets r by itself. Vertical line in Polar Form!

(79) $3x - y + 2 = 0$

$3r\cos\theta - r\sin\theta + 2 = 0$

$r(3\cos\theta - \sin\theta) = -2$

$\boxed{r = \frac{-2}{3\cos\theta - \sin\theta}}$ weird way of expressing a straight line. Not the best use of Polar Form!

122 §6.7 #s 83, 87, 91, 95, 99, 103, 107, 111

(83) $x^2+y^2=a^2$

$r^2=a^2$

$r=\pm a$

$r=a$ covers it.

Very elegant way of expressing circle of radius $r=a$!

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

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

$r^2 = \cos^2\theta - \sin^2\theta$ is fine. Book goes further w/ double-angle ID

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

This form is probably easier to graph than where I originally stopped.

#s 91 - 116 Convert Polar Eq'n to Rectangular Form

(91) $r = 4\sin\theta$

$r = 4\dfrac{y}{r}$

$r^2 = 4y$

$\boxed{x^2+y^2 = 4y}$

Extra:

$x^2+y^2-4y = 0$

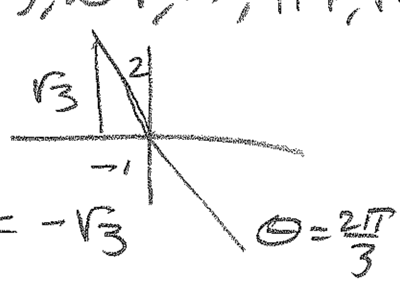
$x^2+y^2-4y+2^2 = 4$

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

Circle of radius $r=2$, centered @ $(h,k)=(0,2)$!

'22 §6.7 #s 95, 99, 103, 107, 111, 117, 119, 121, 123

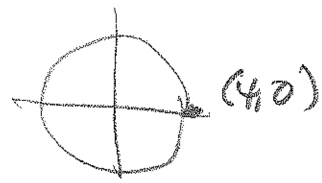
95 $\theta = \frac{2\pi}{3}$



$$\frac{y}{x} = \tan\theta = \tan\frac{2\pi}{3} = -\sqrt{3}$$

$$\boxed{y = -\sqrt{3}\,x}$$

99 $r = 4$



$$\sqrt{x^2+y^2} = 4$$

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

103 $r = -3\sec\theta = -3\frac{r}{x}$

$$\frac{r}{r} = -\frac{3}{x}$$

$$1 = -\frac{3}{x}$$

$$\boxed{x = -3}$$ Vertical line, again!

107 $r^2 = \sin(2\theta) = 2\sin\theta\cos\theta$

$$x^2+y^2 = 2\frac{y}{r}\cdot\frac{x}{r} = \frac{2xy}{r^2} = \frac{2xy}{x^2+y^2}$$

$$\boxed{(x^2+y^2)^2 = 2xy}$$

111 $r = \frac{2}{1+\sin\theta}$

$$\sqrt{x^2+y^2} = \frac{2}{1+\frac{y}{\sqrt{x^2+y^2}}} = \frac{2}{\frac{\sqrt{x^2+y^2}+y}{\sqrt{x^2+y^2}}} = \frac{2\sqrt{x^2+y^2}}{\sqrt{x^2+y^2}+y}$$

$$\Rightarrow 1 = \frac{2}{\sqrt{x^2+y^2}+y}$$

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

122 §6.? #s 111, 117, 119, 121, 123

(111) Hmmmmmm

$r = \frac{2}{1+\sin\theta}$

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

$r + r\sin\theta = 2$

$r + r\frac{y}{r} = 2$

$r + y = 2$

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

Same as before

Book doesn't like it.

Continuez-vous!

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

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

$\boxed{x^2-4y=4}$ is more like the book

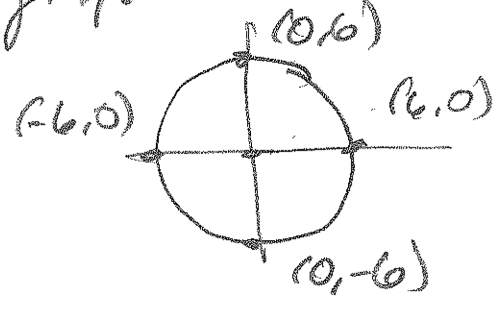
They squared both sides to eliminate the $\sqrt{\ }$.

(117) #s 117-126 Convert to rectangular form. Then sketch the graph

(117) $r = 6$

$\sqrt{x^2+y^2} = 6$

$\boxed{x^2+y^2=36}$

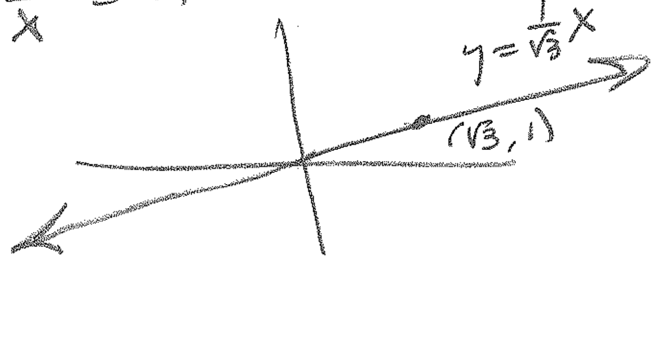


Circle of radius 6.

(119) $\theta = \frac{\pi}{6}$

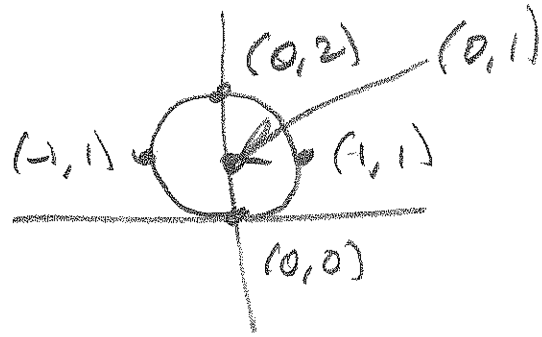
$\tan\theta = \tan\frac{\pi}{6} = \frac{1}{\sqrt{3}} = \frac{y}{x} = m$

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



122 §6.7 #s 121, 123

121 $r = 2\sin\theta$



$r = 2\frac{y}{r}$

$r^2 = 2y$

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

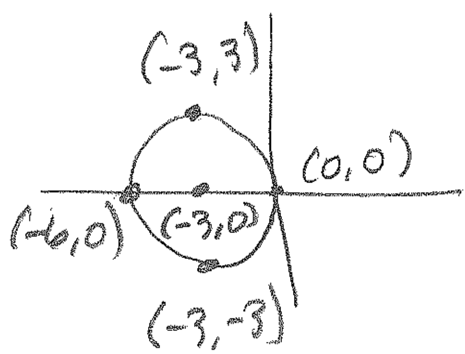
$x^2+y^2-2y = 0$

$x^2+y^2-2y+1^2 = 1$

$\boxed{x^2+(y-1)^2=1}$

circle of radius $r=1$
centered @
$(h,k) = (0,1)$, v.s
$(x-h)^2+(y-k)^2=r^2$

123 $r=-6\cos\theta$



$r = -6\frac{x}{r}$

$r^2 = -6x$

$x^2+y^2+6x=0$

$x^2+6x+3^2+y^2=9$

$\boxed{(x+3)^2+y^2=9}$

$r=3$
$(h,k) = (-3,0)$