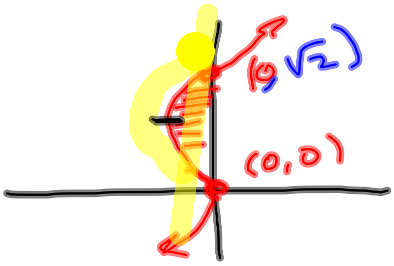
§11.2 #32

$g(t)$ $x = t^2 - 2t = t(t-2)$

$f(t)$ $y = \sqrt{t} \Rightarrow y^2 = t$

Area bdd by this and the y-axis.



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

$dy = y'(t)\,dt = \frac{1}{2} t^{-\frac{1}{2}} dt$

$$\text{Area} = \int_{y=0}^{y=\sqrt{2}} (x_R - x_L)\,dy$$

$$\boxed{= \int_0^{\sqrt{2}} \left(0 - (y^2(y-2))\right) dy}$$

Hold the bus.

$$= \int_{0=t}^{2=t} (0 - x(t))\,dy = -\int_{0=t}^{2=t} \boxed{(t^2 - 2t)\left(\tfrac{1}{2} t^{-\frac{1}{2}}\,dt\right)}$$

etc.

§11.2 II due Wednesday.

Let me think on the pedagogy on this problem.

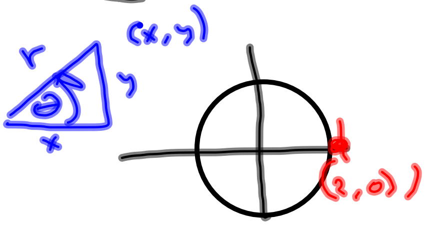
§ 11.3

Identify the curve.

$r^2 = 2^2$

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

#15 $r = 2$



$r = 3\sin\theta$

$x = r\cos\theta$

$y = r\sin\theta$

$y = r\sin\theta = 3\sin\theta \cdot \sin\theta$

$y = 3\sin^2\theta$.

Also,

$r = 3\sin\theta = 3 \cdot \frac{y}{r} \Rightarrow r^2 = 3y \Rightarrow y = \frac{1}{3}r^2 \Rightarrow r^2 = 3y$

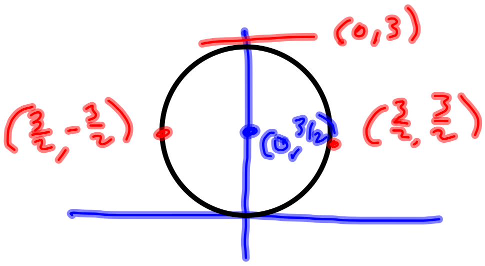
$x^2 + y^2 = r^2 = 3y$

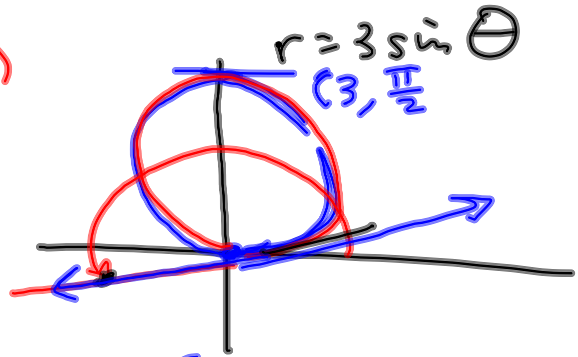
$x^2 + y^2 = 3y$

$x^2 + y^2 - 3y + \left(\frac{3}{2}\right)^2 = 0 + \frac{9}{4}$

$x^2 + \left(y - \frac{3}{2}\right)^2 = \frac{9}{4}$

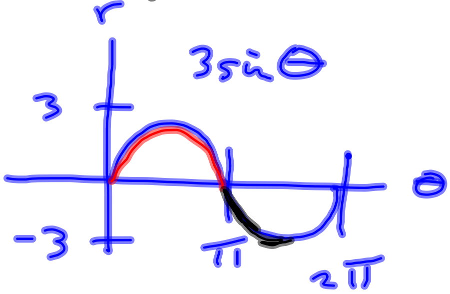
circle of radius $\frac{3}{2}$, centered at $(0, \frac{3}{2})$





$\pi < \theta < 2\pi$

r is negative



$$r = \sec\theta \tan\theta = \frac{1}{\cos\theta} \cdot \frac{\sin\theta}{\cos\theta}$$

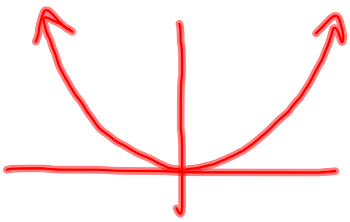
$$r\cos^2\theta = \sin\theta$$

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

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

$$x^2 = y$$

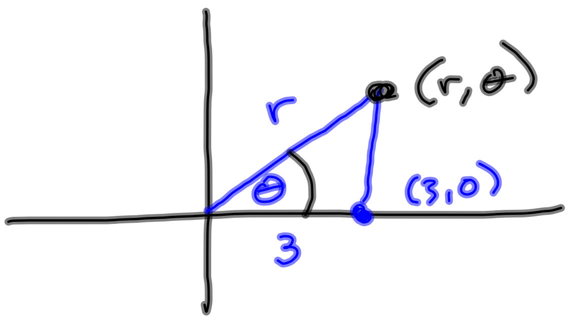
is a parabola!



Go the other way

$x = 3 = r\cos\theta \longrightarrow$

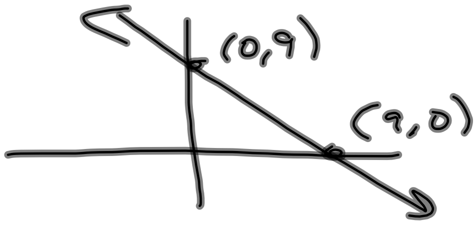
$r = \dfrac{3}{\cos\theta} = 3\sec\theta$ is a vertical line passing thru $x=3$!



$r = 3\sec\theta$

$\dfrac{r}{3} = \sec\theta$

$r = 3\sec\theta$



$$x + y = 9$$

$$r\cos\theta + r\sin\theta = 9$$

$$r(\cos\theta + \sin\theta) = 9$$

$$r = \frac{9}{\cos\theta + \sin\theta}$$

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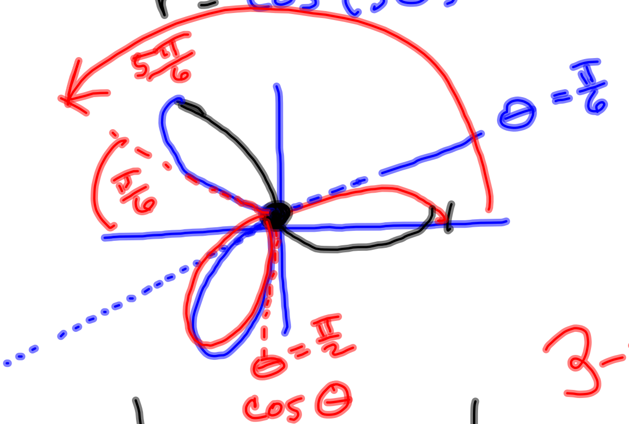
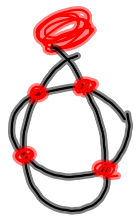
Sketch the graph.

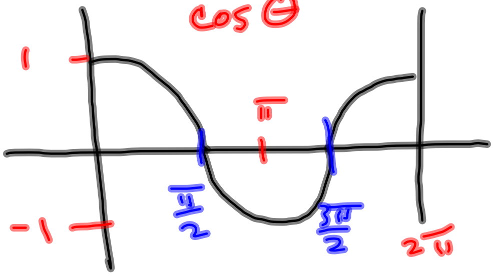
$r = \cos(3\theta)$

θ	r
0	1



3-petal rose





$\cos(3\theta) = 0$

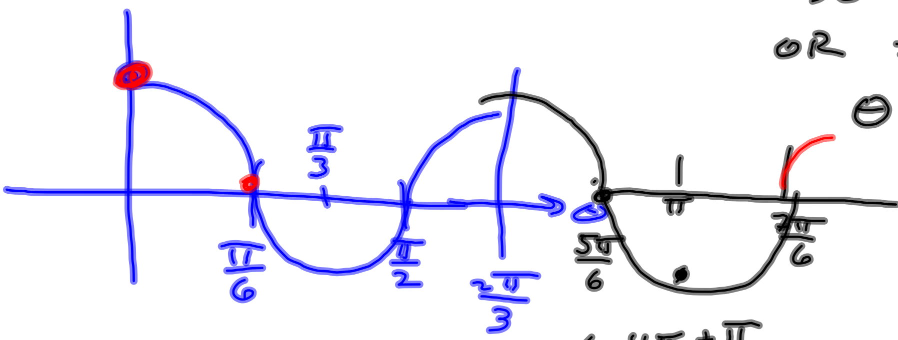
$3\theta = \frac{\pi}{2}, \frac{3\pi}{2}$

$3\theta = \frac{\pi}{2} + 2n\pi$

OR $= \frac{3\pi}{2} + 2n\pi$

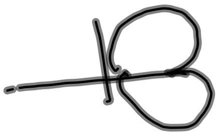
$\theta = \frac{\pi}{6} + \frac{2n\pi}{3}$

$= \frac{\pi}{2} + \frac{2n\pi}{3}$

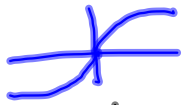


$\frac{2\pi}{3} + \frac{\pi}{6} = \frac{4\pi + \pi}{6}$

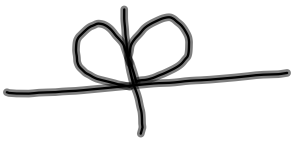
$r(-\theta) = r(\theta) \longrightarrow$ symmetric about polar axis (x-axis)



If unchanged when r is replaced by $-r$, then symmetric about the pole
origin



If unchanged when θ is replaced by $\pi - \theta$, then symmetric about $\theta = \frac{\pi}{2}$



I.O.U. something clearer on #32, §11.2