1. $x = r\cos\theta$ $\quad x = (2-3\sin\theta)\cos\theta$

$y = r\sin\theta$ $\quad y = (2-3\sin\theta)\sin\theta$

$2\sin\theta - 3\sin^2\theta$

$$\frac{dy}{dx} = \frac{2\cos\theta - 6\sin\theta\cdot\cos\theta}{-2\sin\theta + (-3\sin\theta)(-\sin\theta) + \cos\theta(-3\cos\theta)}$$

$$\frac{-2}{-3} = \frac{2}{3}$$

2. $x = 3\sin(2\theta)\cos\theta\big|_{\theta=\frac{\pi}{3}}$

$y = 3\sin(2\theta)\sin\theta\big|_{\theta=\frac{\pi}{3}}$

$\left(3\frac{\sqrt{3}}{2}\cdot\left(\frac{1}{2}\right), \frac{3\sqrt{3}}{2}\cdot\frac{\sqrt{3}}{2}\right)$ $\quad$ pt: $\left(\frac{3\sqrt{3}}{4}, \frac{9}{4}\right)$

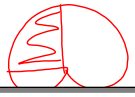
$$\frac{dy}{d\theta} = 3\sin 2\theta\cos\theta + \sin\theta(6\cos 2\theta)$$

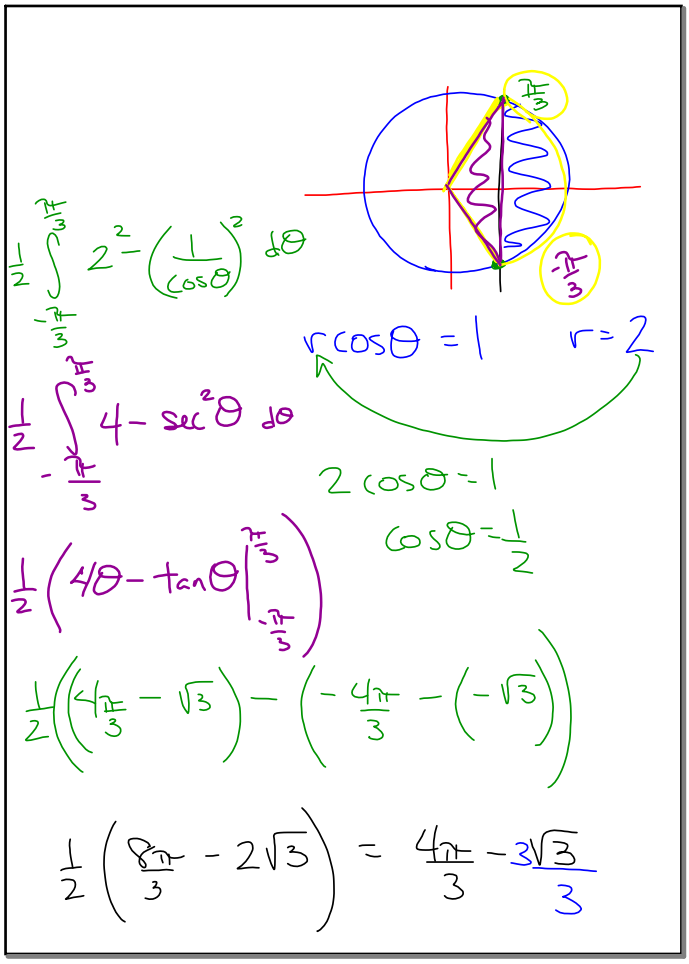
$$\frac{dx}{d\theta} = 3\sin 2\theta(-\sin\theta) + \cos\theta(6\cos 2\theta)$$

$$\frac{3\frac{\sqrt{3}}{2}\cdot\frac{1}{2} + \frac{\sqrt{3}}{2}\left(\frac{3}{6}\cdot\frac{-1}{2}\right)}{3\frac{\sqrt{3}}{2}\left(-\frac{\sqrt{3}}{2}\right) + \frac{1}{2}\left(\frac{3}{6}\cdot\frac{-1}{2}\right)}$$

$$\frac{\frac{3\sqrt{3}}{4} - 2\frac{3\sqrt{3}}{2\cdot 2}}{-\frac{9}{4} - \frac{3}{2\cdot 2}} = \frac{-\frac{3\sqrt{3}}{4}}{-\frac{15}{4}} = \frac{\sqrt{3}}{5}$$

$$y = \frac{\sqrt{3}}{5}\left(x - 3\frac{\sqrt{3}}{4}\right) + \frac{9}{4}$$





$r^2 = 4\cos 2\theta$ $r = \sqrt{2}$

1. $r = 2 - 3\sin\theta$ $(2, \pi)$

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

$y = (2 - 3\sin\theta)\sin\theta$

$$\frac{dy}{dx} = \frac{(2 - 3\sin\theta)(\cos\theta) + \sin\theta(-3\cos\theta)}{(2 - 3\sin\theta)(-\sin\theta) + \cos\theta(-3\cos\theta)}\Bigg|_{\theta=\pi}$$

$$= \frac{-2}{-3} = \frac{2}{3}$$

2. $r = 3\sin(2\theta)$ $\theta = \frac{\pi}{3}$

$x = (3\sin 2\theta)\cos\theta$

$y = (3\sin 2\theta)\sin\theta$

$\left(3\frac{\sqrt{3}}{2}\cdot\frac{1}{2}, 3\frac{\sqrt{3}}{2}\cdot\frac{\sqrt{3}}{2}\right)$

Pt: $\left(\frac{3\sqrt{3}}{4}, \frac{9}{4}\right)$

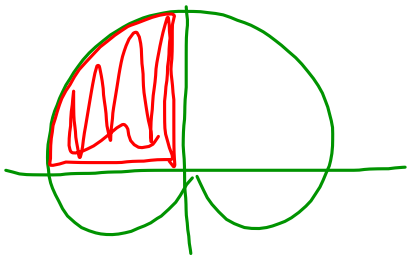
$$\frac{dy}{dx} = \frac{(3\sin 2\theta)\cos\theta + \sin\theta(6\cos 2\theta)}{(3\sin 2\theta)(-\sin\theta) + \cos\theta(6\cos 2\theta)}\Bigg|_{\theta=\frac{\pi}{3}}$$

$$\frac{\left(3\frac{\sqrt{3}}{2}\right)\frac{1}{2} + \frac{\sqrt{3}}{2}\cdot 6\cdot\frac{-1}{2}}{3\frac{\sqrt{3}}{2}\left(-\frac{\sqrt{3}}{2}\right) + \frac{1}{2}\,6\cdot\frac{-1}{2}}$$

$$\frac{\frac{3\sqrt{3}}{4} - \frac{6\sqrt{3}}{4}}{\frac{-9}{4} - \frac{6}{4}} = \frac{+\frac{3\sqrt{3}}{4}}{+\frac{15}{4}}$$

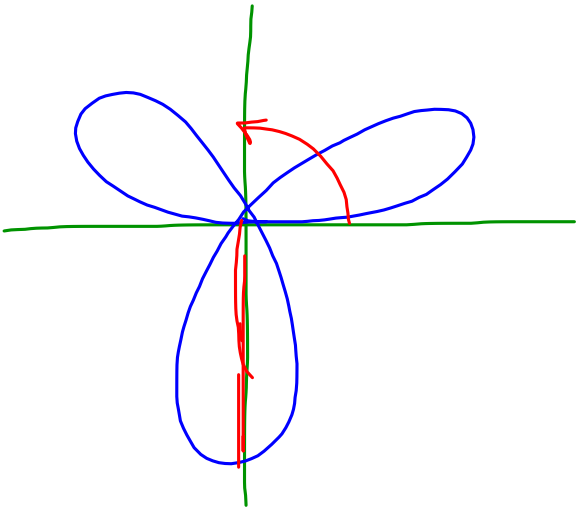
$$= \frac{\sqrt{3}}{5}$$

$$y = \frac{\sqrt{3}}{5}\left(x - \frac{3\sqrt{3}}{4}\right) + \frac{9}{4}$$



6.

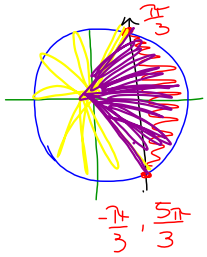
$r = \sin 3\theta$



7. $x=1$

$\frac{r\cos\theta}{\cos\theta}=\frac{1}{\cos\theta}$

$r=\sec\theta$



$r=2$

$2=\frac{1}{\cos\theta}$

$\frac{1}{2}=\cos\theta$

$\frac{1}{2}\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} 2^2-\sec^2\theta\, d\theta$

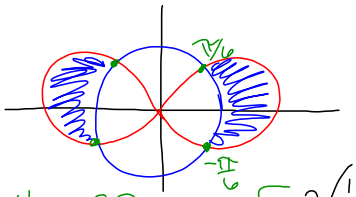
$\frac{1}{2}\left(4\theta-\tan\theta\Big|_{-\frac{\pi}{3}}^{\frac{\pi}{3}}\right)$

$\frac{1}{2}\left(\left(4\frac{\pi}{3}-\sqrt{3}\right)-\left(-\frac{4\pi}{3}-\left(-\sqrt{3}\right)\right)\right)$

$\frac{1}{2}\left(\frac{8\pi}{3}-2\sqrt{3}\right)$

$\frac{4\pi}{3}-\sqrt{3}$

8.



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

$r^2=2$

$2=4\cos 2\theta$

$\cos 2\theta=\frac{1}{2}$

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

$\theta=-\frac{\pi}{6}, \frac{\pi}{6}, \frac{5\pi}{6}$

$r=\sqrt{2}$ $2\left(2\int_{-\frac{\pi}{6}}^{\frac{\pi}{6}} 4\cos 2\theta-2\, d\theta\right)$

$\int_{-\frac{\pi}{6}}^{\frac{\pi}{6}} 4\cos 2\theta-2\, d\theta$

$2\sin 2\theta-2\theta\Big|_{-\frac{\pi}{6}}^{\frac{\pi}{6}}$

$2\frac{\sqrt{3}}{2}-2\frac{\pi}{6}-\left(2\left(-\frac{\sqrt{3}}{2}\right)-2\left(-\frac{\pi}{6}\right)\right)$

$\sqrt{3}-\frac{\pi}{3}+\sqrt{3}-\frac{\pi}{3}$

$2\sqrt{3}-\frac{2\pi}{3}$