1. $r = \sin(3\theta)$ is a rose with 3 petals.

Solution

offset $= \frac{2\pi}{3} = 120°$

at $\theta = \frac{\pi}{6}$, $r = \sin(\frac{\pi}{2}) = 1$

at $\theta = \frac{\pi}{3}$, $r = 0$

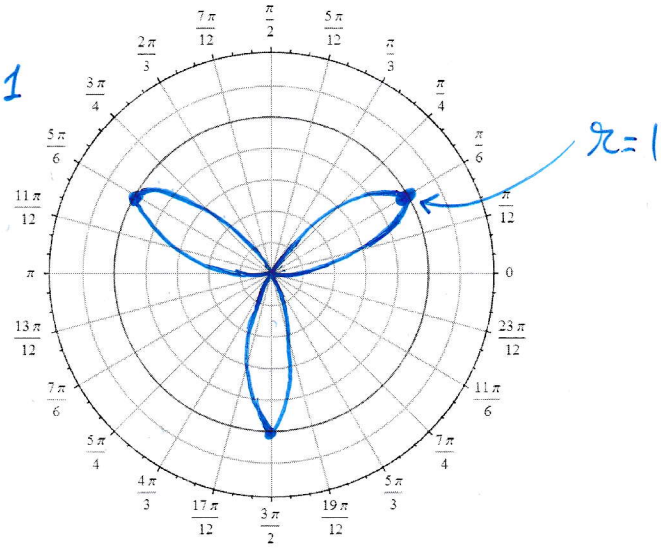

Figure 1:

Quiz #12

1. *(4 points)* Sketch the curve given in polar coordinates by the equation $r = \sin(3\theta)$ into the coordinate system above.
2. *(6 points)* Consider the curve given by $x(t) = 3 - 5t$, $y(t) = t^2 - t + 7$.
   (a) At which points (if any) has the curve a horizontal tangent line ?
   (b) At which points (if any) has the curve a vertical tangent line ?
   (c) For which value of t has the tangent line to the curve at the point $(x(t), y(t))$ slope equal to 2 ?

$x'(t) = -5$, $y'(t) = 2t - 1 = 2(t - \frac{1}{2})$. $\frac{dy}{dx} = \frac{y'(t)}{x'(t)} = \frac{2(t-\frac{1}{2})}{-5}$.

(a) $\frac{dy}{dx} = 0$ at $t = \frac{1}{2} \Rightarrow$ Horizontal tangent at $t = \frac{1}{2}$, $(x,y) = (3 - \frac{5}{2}, \frac{1}{4} - \frac{1}{2} + 7) = (\frac{1}{2}, \frac{27}{4})$

(b) $(x'(t)) = -5 \neq 0$ for any $t \Rightarrow$ no Vertical tangents.

(c) $\frac{dy}{dx} = 2 \Rightarrow \frac{2(t-\frac{1}{2})}{-5} = 2 \Rightarrow 2t - 1 = -10 \Rightarrow 2t = -9$

$\Rightarrow \boxed{t = -\frac{9}{2}}$