Polar Practice

Name: ______________________________ Per. ____

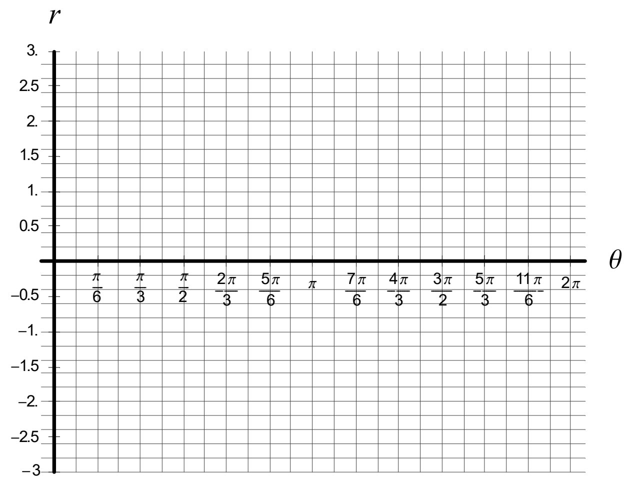
Directions: **Part I**: Graph each polar equation <u>ONE POINT AT A TIME</u>. For each θ: (a) calculate the value of r, (b) graph the coordinates (θ, r) in a rectangular system (as if it were (x, y)), and (c) then (r, θ) in a polar coordinate system. **Part II**: Calculate the derivatives listed. Consider what your results mean in terms of both graphs. **Part III**: **On a separate page, briefly describe what you learned from this.**

(1) $r = 2$

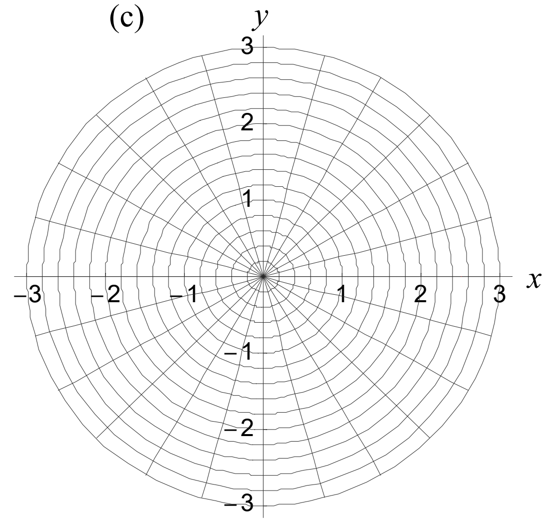
Part I: (a)

θ	r
0	
π / 6	
π / 4	
π / 3	
π / 2	
2π / 3	
3π / 4	
5π / 6	
π	
7π / 6	
5π / 4	
4π / 3	
3π / 2	
5π / 3	
7π / 4	
11π / 6	
2π	

(b)



(c)



Part II: Calculate the derivatives $\dfrac{dr}{d\theta}$ and $\dfrac{dy}{dx}$. Evaluate each at $\theta = 0$ and $\theta = \dfrac{\pi}{4}$. Consider graphs.

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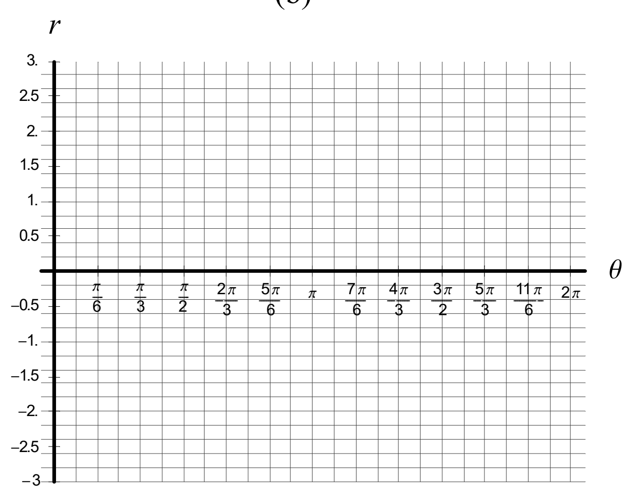
(2) $r = 2\cos\theta$

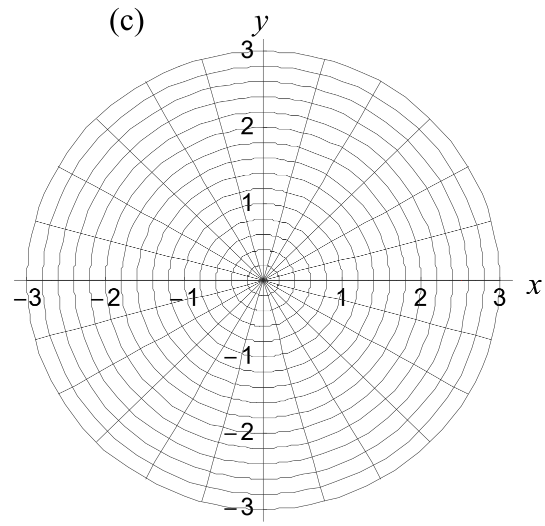
Part I: (a)

θ	r
0	
π / 6	
π / 4	
π / 3	
π / 2	
2π / 3	
3π / 4	
5π / 6	
π	
7π / 6	
5π / 4	
4π / 3	
3π / 2	
5π / 3	
7π / 4	
11π / 6	
2π	

(b)



(c)



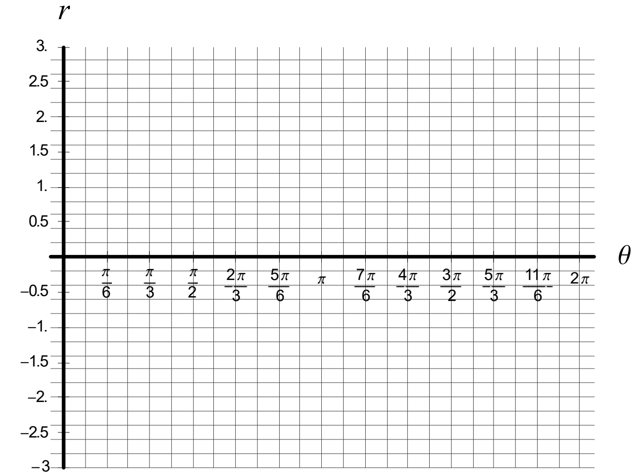
Part II: Calculate the derivatives $\dfrac{dr}{d\theta}$ and $\dfrac{dy}{dx}$. Evaluate each at $\theta = 0$ and $\theta = \dfrac{\pi}{4}$. Consider graphs.

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

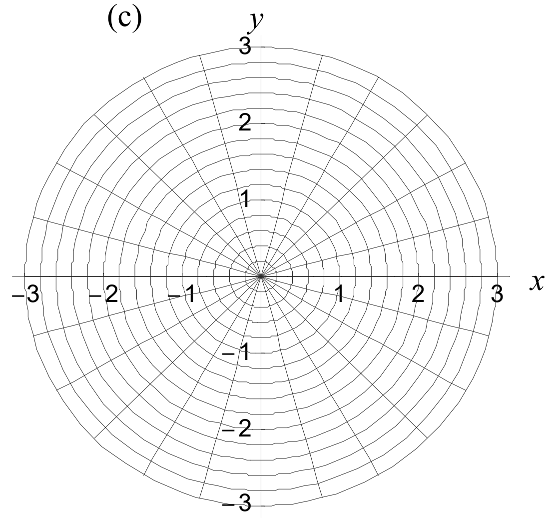
Part I: (a)

θ	r
0	0
$\pi / 6$	$\sqrt{3}$
$\pi / 4$	2
$\pi / 3$	$\sqrt{3}$
$\pi / 2$	0
$2\pi / 3$	$-\sqrt{3}$
$3\pi / 4$	-2
$5\pi / 6$	$-\sqrt{3}$
π	0
$7\pi / 6$	$\sqrt{3}$
$5\pi / 4$	2
$4\pi / 3$	$\sqrt{3}$
$3\pi / 2$	0
$5\pi / 3$	$-\sqrt{3}$
$7\pi / 4$	-2
$11\pi / 6$	$-\sqrt{3}$
2π	0

(b)



(c)



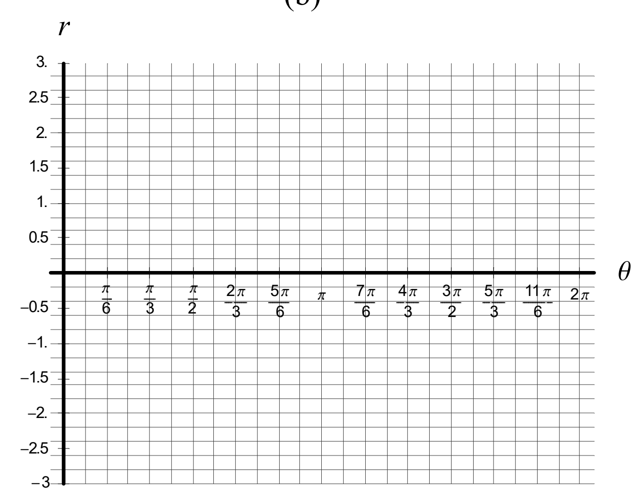
Part II: Calculate the derivatives $\frac{dr}{d\theta}$ and $\frac{dy}{dx}$. Evaluate each at $\theta = 0$ and $\theta = \frac{\pi}{4}$. Consider graphs.

(4) $r = \frac{1}{2} + 2\cos\theta$

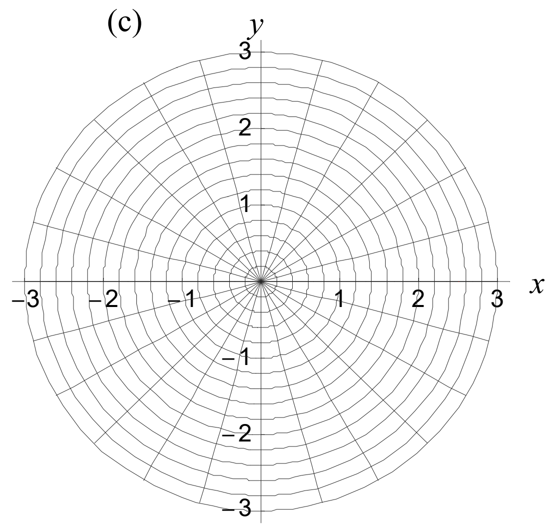
Part I: (a)

θ	r
0	2.5
$\pi / 6$	2.23205
$\pi / 4$	1.91421
$\pi / 3$	1.5
$\pi / 2$	0.5
$2\pi / 3$	-0.5
$3\pi / 4$	-0.914214
$5\pi / 6$	-1.23205
π	-1.5
$7\pi / 6$	-1.23205
$5\pi / 4$	-0.914214
$4\pi / 3$	-0.5
$3\pi / 2$	0.5
$5\pi / 3$	1.5
$7\pi / 4$	1.91421
$11\pi / 6$	2.23205
2π	2.5

(b)



(c)



Part II: Using only the *polar* graph (c), determine whether the following derivatives are positive, negative, zero, or undefined. Do not calculate exact values. **Note angle is π/3 for this.**

$\left.\frac{dr}{d\theta}\right|_{\theta=0}$ $\left.\frac{dy}{dx}\right|_{\theta=0}$ $\left.\frac{dr}{d\theta}\right|_{\theta=\frac{\pi}{3}}$ $\left.\frac{dy}{dx}\right|_{\theta=\frac{\pi}{3}}$ $\left.\frac{dx}{d\theta}\right|_{\theta=\frac{\pi}{3}}$ $\left.\frac{dy}{d\theta}\right|_{\theta=\frac{\pi}{3}}$ $\left.\frac{d^2y}{dx^2}\right|_{\theta=\frac{\pi}{3}}$

Try this for #1 - 3.