Polar Coordinates Review

Name: Answers

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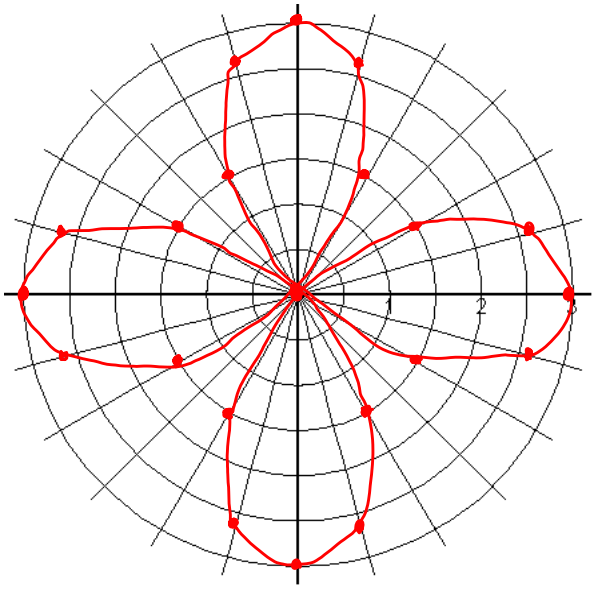
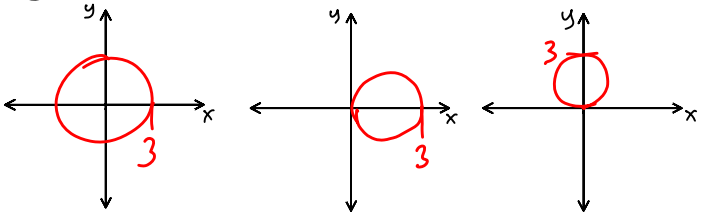


① Plot $f(\theta)=3\cos 2\theta$ using the points below.

θ	$r=3\cos 2\theta$
0	3
$\pi/12$	2.598
$\pi/6$	1.5
$\pi/4$	0
$\pi/3$	-1.5
$5\pi/12$	-2.598
$\pi/2$	-3
$7\pi/12$	-2.598
$2\pi/3$	-1.5
$3\pi/4$	0
$5\pi/6$	1.5
$11\pi/12$	2.598
π	3
$13\pi/12$	2.598
$7\pi/6$	1.5
$5\pi/4$	0
$4\pi/3$	-1.5
$17\pi/12$	-2.598
$3\pi/2$	-3
$19\pi/12$	-2.598
$5\pi/3$	-1.5
$7\pi/4$	0
$11\pi/6$	1.5
$23\pi/12$	2.598
2π	3

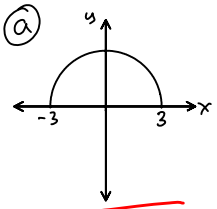
② Sketch the graphs of

ⓐ $f(\theta)=3$ ⓑ $f(\theta)=3\cos\theta$ ⓒ $f(\theta)=3\sin\theta$



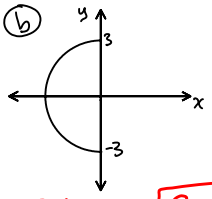
③ $x^2+y^2=9$ is a circle of radius 3. Write the rectangular equation for each of the following graphs.

ⓐ



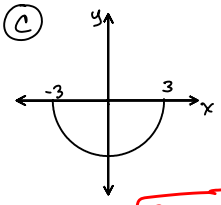
$y=\sqrt{9-x^2}$

ⓑ



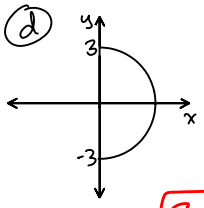
$x=-\sqrt{9-y^2}$

ⓒ



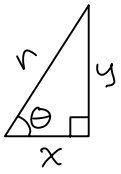
$y=-\sqrt{9-x^2}$

ⓓ



$x=\sqrt{9-y^2}$

④ Use the formulas $x=r\cos\theta$ $y=r\sin\theta$ to prove the formulas for converting x and y to r and θ.



$x^2+y^2=(r\cos\theta)^2+(r\sin\theta)^2$

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

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

$\frac{y}{x}=\frac{r\sin\theta}{r\cos\theta}=\tan\theta$

$\theta=\arctan\frac{y}{x}$

⑤ For each surface, ⓐ Identify it by name. ⓑ Sketch it in 3D. Hint: $z=f(x,y)$

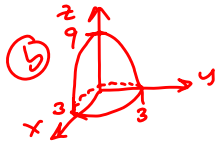
ⓒ Convert the equation to polar coordinates.

ⓓ Describe the projection of the surface in the xy-plane.

ⓘ $f(x,y)=9-x^2-y^2$

ⓐ Circular paraboloid

ⓑ



ⓒ $z=9-r^2$

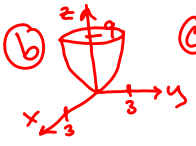
ⓓ Circle of radius 3

ⓘⓘ $f(x,y)=x^2+y^2$

Bounded by $z=9$

ⓐ circular paraboloid

ⓑ



ⓒ $z=r^2$

ⓓ Circle of radius 3

ⓘⓘⓘ $f(x,y)=\sqrt{9-x^2-y^2}$

ⓐ Top half of a sphere

ⓑ

ⓒ $z=\sqrt{9-r^2}$

ⓓ Circle of radius 3