Analysis H – Hahn / Hlasek / Tantod
Unit 3 Quiz 1 – Polar graphing
NO CALCULATORS

24
24 points

Michi T. loves Analysis, for richler or polar
Period: 6

1. Convert the rectangular points to polar coordinates with positive r and $0 \le \theta < 2\pi$. [2 pts each]

a) $(8\sqrt{2},\ -8\sqrt{2})$

$r = \sqrt{x^2+y^2}$
$= \sqrt{64\cdot 2 + 64\cdot 2}$
$= \sqrt{4\cdot 64}$
$= 2\cdot 8$
$= 16$

$\theta = \frac{7\pi}{4}$

$(16, \frac{7\pi}{4})$ ✓

b) $(-7\sqrt{3},\ 0)$

$r = \sqrt{x^2+y^2}$
$= \sqrt{(-7\sqrt{3})^2}$
$= 7\sqrt{3}$

$\theta = \pi$

$(7\sqrt{3}, \pi)$ ✓

2. Convert the polar points to rectangular coordinates. [2 pts each]

a) $\left(9,\ \frac{7\pi}{6}\right)$

$x = r\cos\theta$
$= 9\cos\frac{7\pi}{6}$
$= -\frac{9\sqrt{3}}{2}$

$y = r\sin\theta$
$= 9\sin\frac{7\pi}{6}$
$= -\frac{9}{2}$

$\left(-\frac{9\sqrt{3}}{2}, -\frac{9}{2}\right)$ ✓

b) $\left(-8,\ -\frac{27\pi}{2}\right)$ $\quad -\frac{24\pi + 3\pi}{2} = -\frac{3\pi}{2} \to \frac{\pi}{2}$

$(0, -8)$ ✓

$x = -8\cos\left(\frac{\pi}{2}\right)$
$= 0$
$y = -8\sin\left(\frac{\pi}{2}\right)$
$= -8$

3. Convert the polar equation to rectangular. Give your answers in the form of y as a function of x. [2 pts each]

a) $13 = \cot\theta$

$13 = \frac{\cos\theta}{\sin\theta}$

$13\sin\theta = \cos\theta$

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

$y = \frac{x}{13}$ ✓

$r = 13$

$13 = \frac{\cos\theta}{\sin\theta}$

$(13\sin\theta = \cos\theta)\, r$

$13r\sin\theta = r\cos\theta$

$13y = x$

$y = \frac{x}{13}$

b) $r = 7$

$r^2 = 49$

$x^2 + y^2 = 49$

$y^2 = 49 - x^2$

$y = \pm\sqrt{49 - x^2}$ ✓

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

$r^2 = 49$

$x^2 + y^2 = 49$

$y^2 = 49 - x^2$

$y = \pm\sqrt{49 - x^2}$

r=7

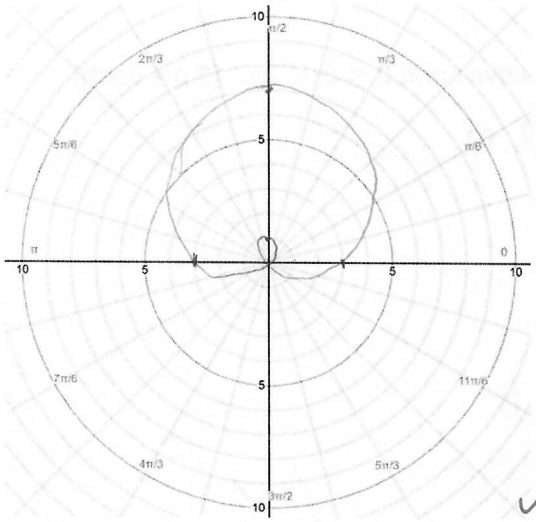
x	y
0	± 7
7	0

✓

-0

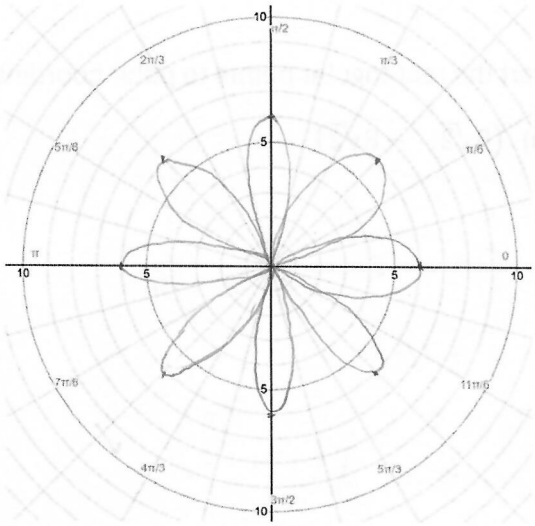
4. Graph each equation. Then classify each graph according to its most specific name. [2 for graph, 1 for name]

a) $r = 3 + 4\sin\theta$



Name: Inner Loop Limaçon ✓

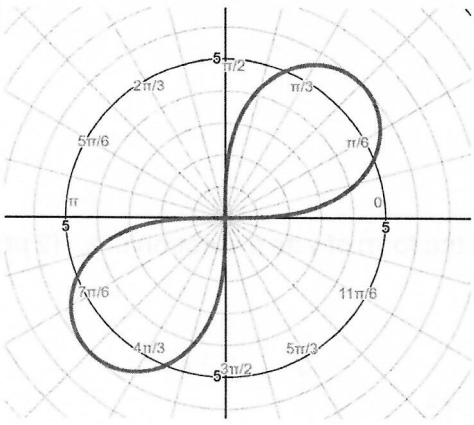
b) $r = 6\cos 4\theta$ 8 petals



Name: Polar rose of 8 petals ✓

5. Write the equation of each graph. Then classify each graph according to its most specific name. [2 for equation, 1 for name]

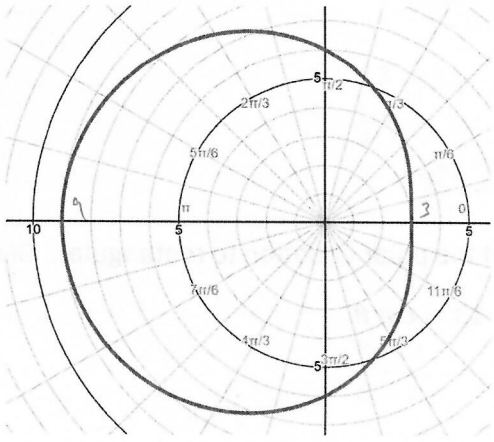
a)



Equation: $r^2 = 36\sin 2\theta$ ✓

Name: Sine Lemniscate ✓

b)



$a+b=9 \quad a-b=3 \quad a=6 \quad b=3$

Equation: $r = 6 - 3\cos\theta$ ✓

Name: Convex Limaçon ✓ (dimpled)?

convex → tangent only passes 1 point at max → dimpled Limaçon

-0