MATH 152
Mrs. Bonny Tighe

QUIZ 11A

25 points
11.3

NAME Answers

Section_____ Wed 12/7/05

1. Find the Cartesian coordinates for the polar coordinate

a) $(3, 5\pi/4)$ $\left(-3\sqrt{2}/2,\ 3\sqrt{2}/2\right)$

$x = r\cos\theta = 3\cos 5\pi/4 = -3\sqrt{2}/2$

$y = r\sin\theta = 3\sin 5\pi/4 = 3(\sqrt{2}/2)$

b) $(3, -5\pi/3) =$ $\left(3/2,\ 3\sqrt{3}/2\right)$

$x = 3\cos(-5\pi/3) = 3(1/2)$

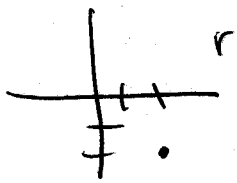
$y = 3\sin(-5\pi/3) = 3(\sqrt{3}/2)$

and **two different Polar** coordinates for the points:

a) (2,-2) $(2\sqrt{2}, \frac{3\pi}{4})$ and $(2\sqrt{2}, -\pi/4)$ $(-2\sqrt{2}, 3\pi/4)$

$r^2 = 4+4 =$

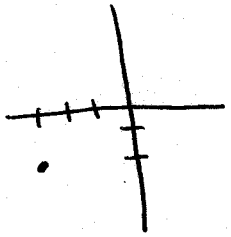
$r = \sqrt{8} = 2\sqrt{2}$



b) (-3, -2) $(\sqrt{13}, \tan^{-1}(\frac{2}{3}) + \pi)$ and $(-\sqrt{13}, \tan^{-1}(\frac{2}{3}))$

$r^2 = 9+4$

$r = \sqrt{13}$



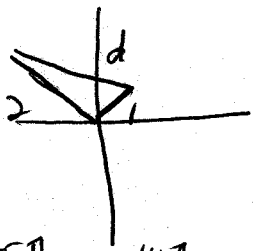
2. Find the distance between the two points with polar coordinates

$(2, 5\pi/6)$ *and* $(1, \pi/4)$

$d^2 = 2^2 + 1^2 - 2(2)(1)\cos\left(\frac{5\pi}{6} - \frac{\pi}{4}\right)$

$3 - 4\cos 7\pi/12$

$d = \sqrt{3 - 4\cos 7\pi/12}$



$\frac{5\pi}{6} = \frac{10\pi}{12}$

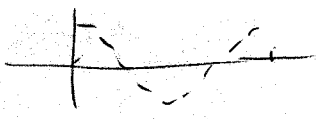
$\frac{\pi}{4} = \frac{3\pi}{12}$

3. Find the slope of the tangent line to the curve $r = \cos 2\theta$ *at* $\theta = \pi/4$

$\frac{dr}{d\theta} = -2\sin 2\theta$

$\frac{dy}{dx} = \frac{dr/d\theta \sin\theta + r\cos\theta}{dr/d\theta \cos\theta - r\sin\theta} = \frac{-2\sin 2\theta(\sin\theta) + \cos 2\theta(\cos\theta)}{-2\sin 2\theta(\cos\theta) - \cos 2\theta(\sin\theta)}$

$\frac{dy}{dx} = \frac{-2\sin\pi/2 \cdot \sin\pi/4 + \cos\pi/2 \cos\pi/4}{-2\sin\pi/2 \cdot \cos\pi/4 - \cos\pi/2 \sin\pi/4} = \frac{-2(1)(\frac{\sqrt{2}}{2}) + 0}{-2(1)(\sqrt{2}/2) - 0} = 1$



4. Find a polar equation for the curve represented by the Cartesian equation $x-2y=3$.

$r\cos\theta - 2r\sin\theta = 3$

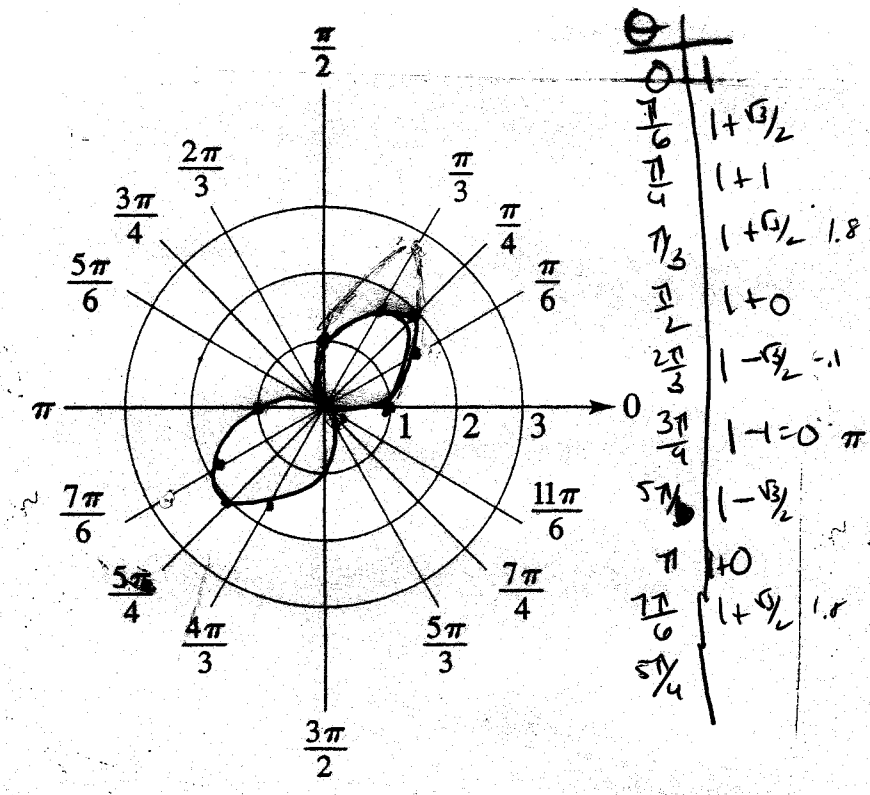
$r = \dfrac{3}{\cos\theta - 2\sin\theta}$

5. Sketch the curve with the given polar equation.

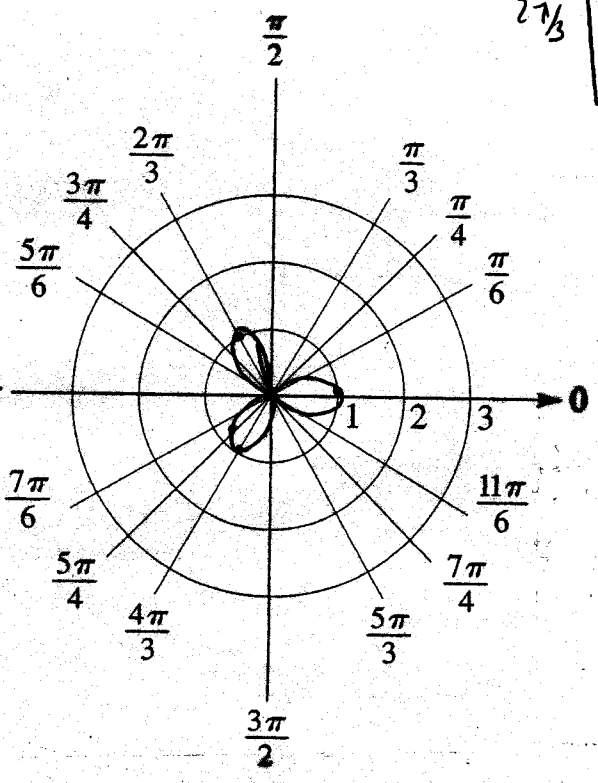
a) $r = 1+\sin 2\theta$

b) $r = \cos 3\theta$

θ	
0	1
$\pi/6$	0
$\pi/4$	$-\sqrt{2}/2$
$\pi/3$	-1
$\pi/2$	0
$2\pi/3$	1



θ	
0	1
$\pi/6$	$1+\sqrt{3}/2$
$\pi/4$	$1+1$
$\pi/3$	$1+\sqrt{3}/2$ 1.8
$\pi/2$	$1+0$
$2\pi/3$	$1-\sqrt{3}/2$ .1
$3\pi/4$	$1-1=0$
$5\pi/6$	$1-\sqrt{3}/2$
π	$1+0$
$7\pi/6$	$1+\sqrt{3}/2$ 1.8
$5\pi/4$	



6. Find the points on the curve $r = 1+\cos\theta$ where the tangent line is horizontal or vertical.

$\dfrac{dy}{dx} = \dfrac{dr/d\theta\sin\theta + r\cos\theta}{dr/d\theta\cos\theta - r\sin\theta}$ $dr/d\theta = -\sin\theta$

$= \dfrac{-\sin^2\theta + (1+\cos\theta)\cos\theta}{-\sin\theta\cos\theta - (1+\cos\theta)\sin\theta}$ $=0$ Horizontal $=0$ Vertical

$-\sin^2\theta + \cos\theta + \cos^2\theta = 0$

$-(1-\cos^2\theta) + \cos\theta + \cos^2\theta = 0$

$-1 + \cos\theta + 2\cos^2\theta = 0$

$(2\cos\theta - 1)(\cos\theta + 1) = 0$

$\cos\theta = 1/2$ $\cos\theta = -1$

$\theta = \pi/3 + 2\pi k,\ \dfrac{5\pi}{3} + 2\pi k$ $\theta = 3\pi/2 + 2\pi k$

$-\sin\theta\cos\theta - \sin\theta - \sin\theta\cos\theta = 0$

$-2\sin\theta\cos\theta - \sin\theta = 0$

$\sin\theta(-2\cos\theta - 1) = 0$

$\sin\theta = 0$ $\cos\theta = -1/2$

$\theta = \pi k$ $\theta = \dfrac{2\pi}{3} + 2\pi k,\ \dfrac{4\pi}{3} + 2\pi k$