Math 43
Quiz 4 Version X Page 1
Tue Oct 23, 2012

NAMES YOU ASKED TO BE CALLED IN CLASS:

_____ & _____

SCORE: ___ / 35 POINTS

1. NO CALCULATORS ALLOWED
2. SHOW PROPER WORK & SIMPLIFY YOUR FINAL ANSWER TO RECEIVE FULL CREDIT

Consider the polar equation $r = 1 + 2\cos 2\theta$. **SCORE: _____ / 13 PTS**

[a] Your partner runs the following symmetry tests, and gets the following correct results:

If you replace (r, θ) with $(-r, \theta)$, you can **NOT** simplify the equation back to the original equation.
If you replace (r, θ) with $(-r, -\theta)$, you can **NOT** simplify the equation back to the original equation.
If you replace (r, θ) with $(r, -\theta)$, you can simplify the equation back to the original equation.

Based only on the tests above, what can you conclude about whether the graph of the equation is symmetric

[i] with respect to $\theta = \frac{\pi}{2}$? CAN'T TELL (1/2)

[ii] with respect to the polar axis ? SYMMETRIC (1/2)

[iii] with respect to the pole ? CAN'T TELL (1/2)

[b] Determine whether the graph is symmetric with respect to the pole, the polar axis, and $\theta = \frac{\pi}{2}$.
You may use any or all of the test results in part [a] without rerunning the tests.

POLE $(r, \pi+\theta)$: $r = 1 + 2\cos 2(\pi+\theta)$ (1)

$= 1 + 2\cos(2\pi + 2\theta)$ (1/2)

$= 1 + 2[\cos 2\pi \cos 2\theta - \sin 2\pi \sin 2\theta]$ (1)

$= 1 + 2\cos 2\theta$ (1/2)

SYMMETRIC OVER POLE, POLAR AXIS + $\theta = \frac{\pi}{2}$

[c] What is the minimum interval for θ that you would need to plot points before using symmetry to finish drawing the graph ?

$[0, \frac{\pi}{2}]$ (1)

[d] Find the zeros of the polar equation in the minimum interval from part [c].

(1) $0 = 1 + 2\cos 2\theta$ $\quad 0 \le \theta \le \frac{\pi}{2}$

(1/2) $\cos 2\theta = -\frac{1}{2}$ $\quad 0 \le 2\theta \le \pi$

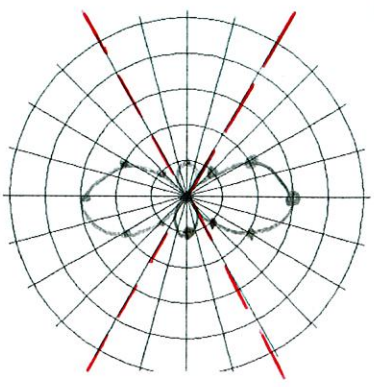
$2\theta = \frac{2\pi}{3}$

(1) $\theta = \frac{\pi}{3}$

GRADED BY ME

[e] Graph the polar equation using symmetry, zeros and any other additional points.
NOTE: You must find the value of *r* for all common angles from the minimum interval.

θ	r	
0	$1 + 2\cos 2(0) = 3$	(1/2)
$\frac{\pi}{6}$	$1 + 2\cos 2(\frac{\pi}{6}) = 2$	(1/2)
$\frac{\pi}{4}$	$1 + 2\cos 2(\frac{\pi}{4}) = 1$	(1/2)
$\frac{\pi}{3}$	$1 + 2\cos 2(\frac{\pi}{3}) = 0$	
$\frac{\pi}{2}$	$1 + 2\cos 2(\frac{\pi}{2}) = -1$	(1/2)



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Consider the polar equation $r = \dfrac{5}{3+2\cos\theta}$.

SCORE: _____ / 9 PTS

[a] Find the **rectangular** coordinates of all intercepts of the graph. **NOTE: Do NOT convert the equation to rectangular form.**

θ	r
0	1
$\frac{\pi}{2}$	$\frac{5}{3}$
π	5
$\frac{3\pi}{2}$	$\frac{5}{3}$

(1) $(1,0)$ $(-5,0)$ (1)

(1) $(0,\frac{5}{3})$ $(0,-\frac{5}{3})$ (1)

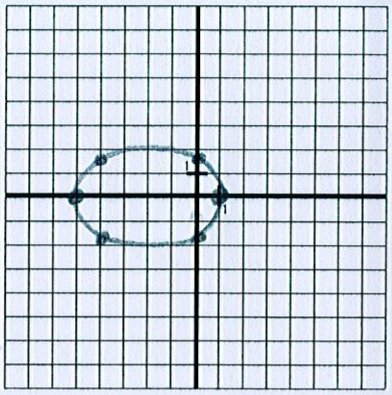
[b] Find the **rectangular** coordinates of all latera recta of the graph. **NOTE: "Latera recta" is the plural of "latus rectum".** You will need to find the rectangular coordinates of the foci first.

CENTER $= \left(\frac{1+-5}{2}, 0\right) = (-2,0)$

FOCUS $= (2(-2), 0) = (-4,0)$

LR $=$ (1½) $(-4,\frac{5}{3})$ (½) $(-4,-\frac{5}{3})$ (½) $(0,\frac{5}{3})$ $(0,-\frac{5}{3})$ (½)

[c] Graph the polar equation using all points from parts [a] and [b].



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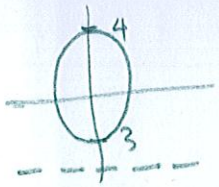
Find the polar equation of the ellipse with foci at the pole and vertices at polar coordinates $(4, \frac{\pi}{2})$ and $(3, \frac{3\pi}{2})$.

SCORE: _____ / 7 PTS

Simplify your final answer.



$r = \dfrac{ep}{1-e\sin\theta}$ (1)

$4 = \dfrac{ep}{1-e}$ (1) $\quad 3 = \dfrac{ep}{1+e}$ (1)

$ep = 4(1-e) \quad ep = 3(1+e)$

$4-4e = 3+3e$ (1)

$1 = 7e$

$e = \frac{1}{7}$ (1)

$\frac{1}{7}p = 3(\frac{8}{7})$

$p = 24$ (1)

$= \dfrac{\frac{1}{7}(24)}{1-\frac{1}{7}\sin\theta} \cdot \dfrac{7}{7}$

$= \dfrac{24}{7-\sin\theta}$ (1)

Eliminate the parameter to find the rectangular equation corresponding to the parametric equations $x = \dfrac{1}{t-2}$, $y = \dfrac{t}{t+1}$.

SCORE: _____ / 6 PTS

Simplify your final answer.

$x(t-2) = 1$

$t-2 = \frac{1}{x}$

$t = \frac{1}{x}+2$ (2)

$y = \dfrac{\frac{1}{x}+2}{\frac{1}{x}+3} \cdot \dfrac{x}{x}$ (2)

$y = \dfrac{1+2x}{1+3x}$ (2)