Math 43
Quiz 4 Version Y 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 $(r, \theta)$ with $(-r, \theta)$, you can **NOT** simplify the equation back to the original equation.
If you replace $(r, \theta)$ with $(-r, -\theta)$, you can **NOT** simplify the equation back to the original equation.
If you replace $(r, \theta)$ 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)

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

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

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

SYMMETRIC OVER POLAR AXIS, POLE + $\theta = \frac{\pi}{2}$ (1)

[c] What is the minimum interval for $\theta$ 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].

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

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

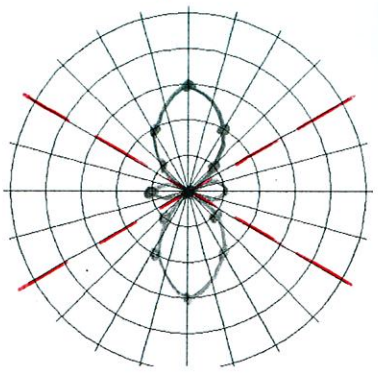
$2\theta = \frac{\pi}{3}$

$\theta = \frac{\pi}{6}$ (1)

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.**

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



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**1. NO CALCULATORS ALLOWED**
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Consider the polar equation $r = \dfrac{5}{3+2\sin\theta}$.

SCORE: _____ / 9 PTS

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

| $\theta$ | $r$ |
|---|---|
| $0$ | $\frac{5}{3}$ |
| $\frac{\pi}{2}$ | $1$ |
| $\pi$ | $\frac{5}{3}$ |
| $\frac{3\pi}{2}$ | $5$ |

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

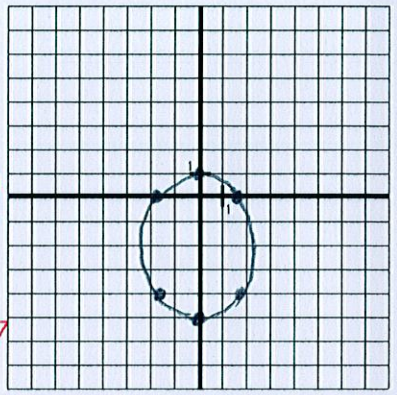
(1) $(0, 1)$ $(0, -5)$ (1)

[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 $= (0, \frac{1+-5}{2}) = (0, -2)$

FOCUS $= (0, 2(-2)) = (0, -4)$ (½)

LR $= (\frac{1}{2})(\frac{5}{3}, -4)(\frac{1}{2})(-\frac{5}{3}, -4)$ (½) $(\frac{5}{3}, 0)$ $(-\frac{5}{3}, 0)$



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

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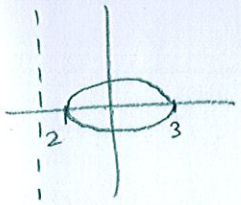
Find the polar equation of the ellipse with foci at the pole and vertices at polar coordinates $(3, 0)$ and $(2, \pi)$.

SCORE: _____ / 7 PTS

**Simplify your final answer.**




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

$= \dfrac{\frac{1}{5}(12)}{1-\frac{1}{5}\cos\theta} \cdot \dfrac{5}{5}$

$= \dfrac{12}{5-\cos\theta}$ (1)

$3 = \dfrac{ep}{1-e}$ (1) $\quad 2 = \dfrac{ep}{1+e}$ (1)

$ep = 3(1-e) \quad ep = 2(1+e)$

$3-3e = 2+2e$ (1)

$1 = 5e$

(1) $e = \frac{1}{5}$

$\frac{1}{5}p = 2(\frac{6}{5})$

$p = 12$ (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)

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

$y = \dfrac{1-2x}{1-3x}$

(2)