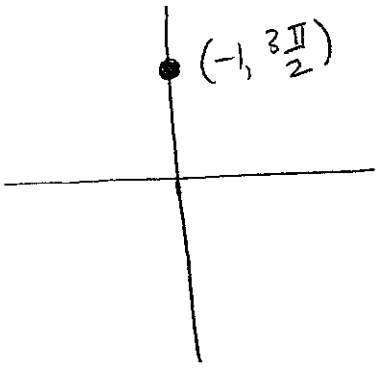
MATH 231 U1, Spring 2009
Quiz 11, Version 1
Friday May 1st, 2009

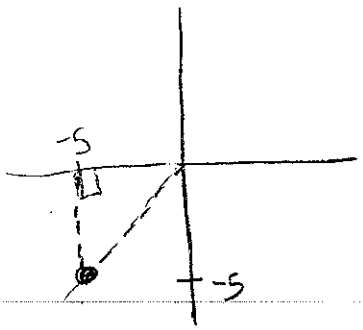
ANSWERS

1. Convert the following points from rectangular coordinates to polar ones or vice versa as indicated.
(a) If $(r, \theta) = (-1, \frac{3\pi}{2})$, give the rectangular coordinates.



In rectangular coords it is $(0, 1)$.

(b) If $(x, y) = (-5, -5)$, give some polar coordinates.



$|r| = \sqrt{25+25} = \sqrt{50}$

$\theta = \tan^{-1}(1) = \pi/4 \left(+\pi K \text{ for integers } K\right)$

and clearly the point is in the 3rd quadrant

So $(r, \theta) = (-\sqrt{50}, \frac{\pi}{4})$

or

$(r, \theta) = (\sqrt{50}, \frac{5\pi}{4})$

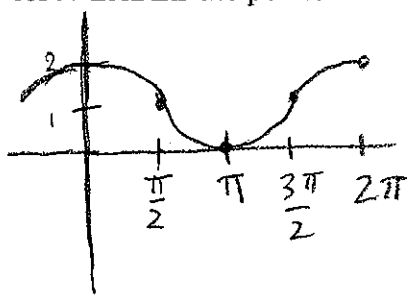
or

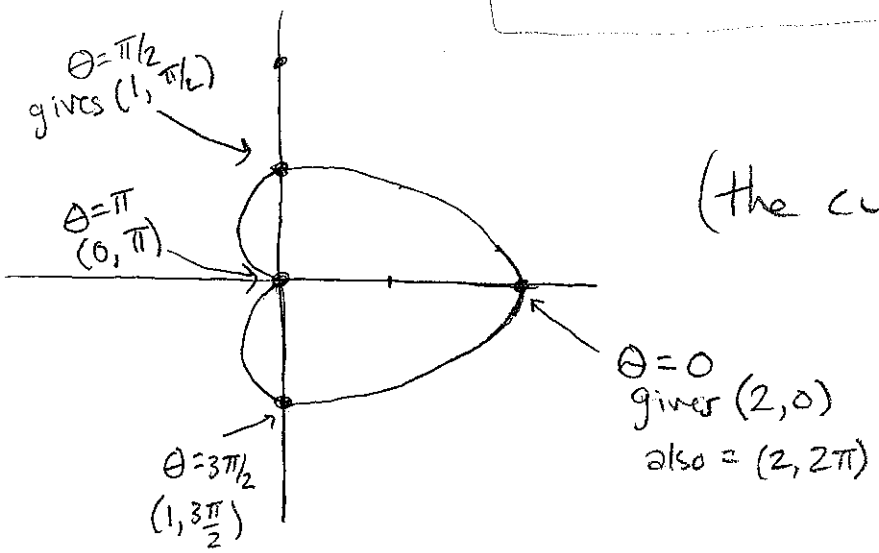
$(r, \theta) = (\sqrt{50}, -\frac{3\pi}{4})$

etc (You Just needed one answer)

2. Sketch the curve given by the polar equation $r = 1 + \cos\theta$. LABEL the points which correspond to $\theta = 0$ and $\theta = \pi$.

"Helper graph" in rect. coords:

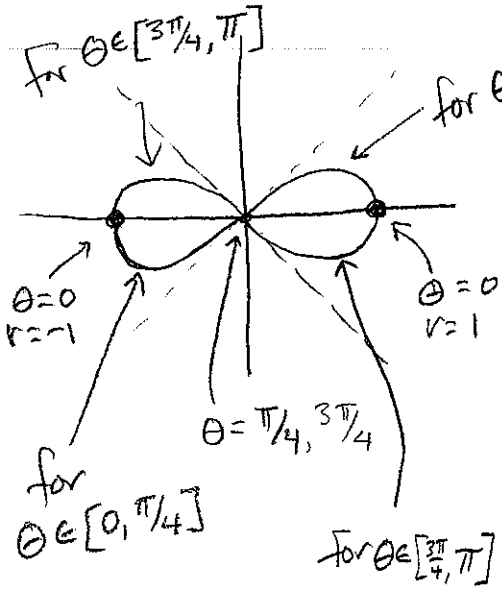




(the curve is traced once for $\theta \in [0, 2\pi]$)

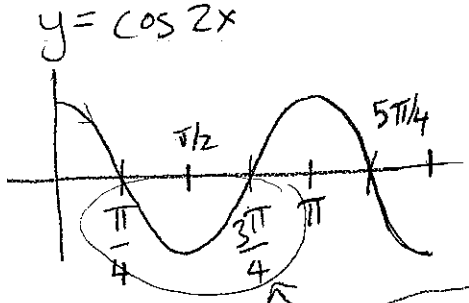
(CARDIOID)

Extra Credit (5 points, all or nothing): Sketch the curve given by the polar equation $r^2 = \cos 2\theta$



θ	r (may have 2 values or none!)
0	± 1
$\pi/4$	0
$\pi/2$	DNE
$\frac{3\pi}{4}$	0
π	± 1
$\pi/6$	$\pm\sqrt{1/2}$

NOTE there are NO POINTS on the graph for θ which make $\cos 2\theta < 0$



θ	r
$\pi/3$	DNE
$\frac{5\pi}{6}$	$\pm\sqrt{1/2}$
$\pi/2$	$\pm\sqrt{\sqrt{3}/2}$

for θ which give $\cos 2\theta < 0$, r DNE