KFUPM MATH201 **Time: 20min** Quiz#1 **Sec.6**

Name: Sr#:

Q1. Let C be the curve defined by the parametric equations

$x = 2 + 3cos(t),\ y = 1 + 3sin(t),\ 0 \le t \le \pi$

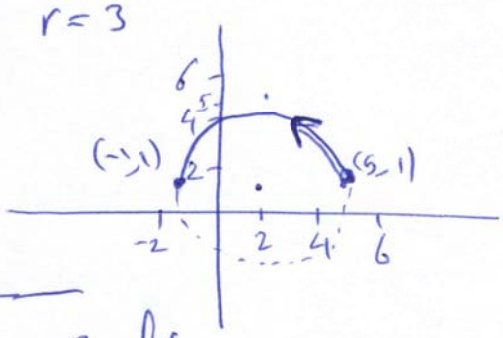
a) Find Cartesian equation for C
b) Sketch the graph and indicate on it the direction in which C traced.
c) Find the area of the surface generated by revolving C about the *x-axis*.

a) $\left(\frac{x-2}{3}\right)^2 + \left(\frac{y-1}{3}\right)^2 = \cos^2 t + \sin^2 t = 1 \Rightarrow (x-2)^2 + (y-1)^2 = 9$

b) Circle center (2,1) radius $r = 3$

$t = 0 \to (5, 1)$, $t = \frac{\pi}{2} \to (2, 4)$

$t = \pi \to (-1, 1)$



c) $A = 2\pi \int_0^{\pi} (1+3\sin t)\sqrt{9\sin^2 t + 9\cos^2 t}\, dt$

$= 2\pi \int_0^{\pi} (1+3\sin t)\, 3\, dt$

$= 6\pi \left[t - 3\cos t \right]_0^{\pi} = 6\pi \left[\pi - 3 - (0 - 3) \right]$

$= 6\pi^2$

Q2. Consider the curve C whose equation in polar coordinate is given by

$$r^2 = 4cos(2\theta)$$

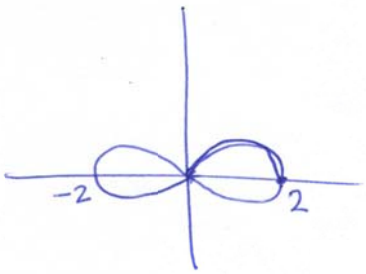
a) Find the symmetric in the graph of C (if any).
b) Sketch the graph in *xy-plane*.
c) Find the area of the region enclosed by C.

x-axis $(r, -\theta) \rightarrow r^2 = 4\cos(2(-\theta)) \rightarrow r^2 = 4\cos 2\theta$ ✓ (r, θ)

y-axis $(r, \pi-\theta) \rightarrow r^2 = 4\cos(2(\pi-\theta))$
$r^2 = 4\cos(2\pi - 2\theta) = \cos 2\theta$ ✓

origin ✓

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{\pi}{4}$
r	2	$2\sqrt{3}$	$\sqrt{2}$	2	0



$A = 4\int_0^{\frac{\pi}{4}} \frac{1}{2} 4\cos 2\theta \, d\theta$

$= 8\left[\frac{\sin 2\theta}{2}\right]_0^{\frac{\pi}{4}} = 4[1-0] = 4$