Math 222 Quiz 10

April 20, 2011

Your Name: *Your Section:*

Instructions: You have 20 minutes to solve the following problems and the total score is 10 points.

1. Find the slope of the curve $x = t^3 + t, y + 2t^3 = 2x + t^2$ at $t = 1$. $(2')$ Get the tangent line there. $(1')$

2. The cycloid can be parametrized as $x = a(t - \sin t), y = a(1 - \cos t)$. Find the area under one arch (and above x-axis)$(2')$ and the length of one arch. $(2')$

3. (a). Find Cartesian coordinate of $P(\sqrt{2}, \pi/4)$ (in polar coordinate). Plot it. $(2')$
   (b). Change the Cartesian equation into its equivalent polar equation: $y^2 = 4x$ $(1')$

Bonus 1:(a). Fill in the blanks (3′):
$\int_2^2 \sqrt{10\cos^2 t + 8\sin^2 t}dt =$ _____ $\int_{-1}^1 (1 + \frac{t}{\sqrt{10\cos^2 t + 8\sin^2 t}})dt =$ _____
If s is the **arc length** parameter, then $\int_2^5 \sqrt{x'(s)^2 + y'(s)^2}ds =$ _____
(b). The velocity vector for $x = x(t), y = y(t)$ is $\overrightarrow{v} =< \frac{dx}{dt}, \frac{dy}{dt} >$. Give a geometric explanation for the formula $\frac{dy}{dx} = \frac{dy/dt}{dx/dt}$. (2′)

Bonus 2: Polar eqns: What's this curve called $r = \frac{6}{2+3\cos\theta}$?(2′) How about $r = 2\cos\theta$? (1′)