Name: SOLUTIONS Student ID:

MATH 53, QUIZ 1: STEWART 10.1-10.3

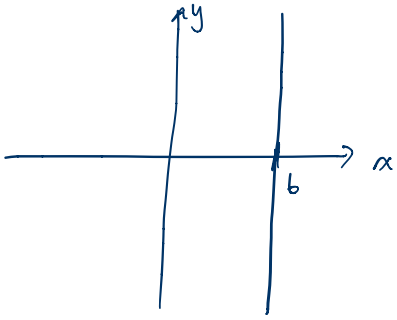
Be sure to show neat, organized, complete work in the space provided.

1. Find a Cartesian equation for the polar curve $r = 6\sec\theta$, and **sketch a picture**[*] of it in the xy-plane.

$r = \frac{6}{\cos\theta}$

$r\cos\theta = 6$

$x = 6$



Cartesian equation: $x = 6$

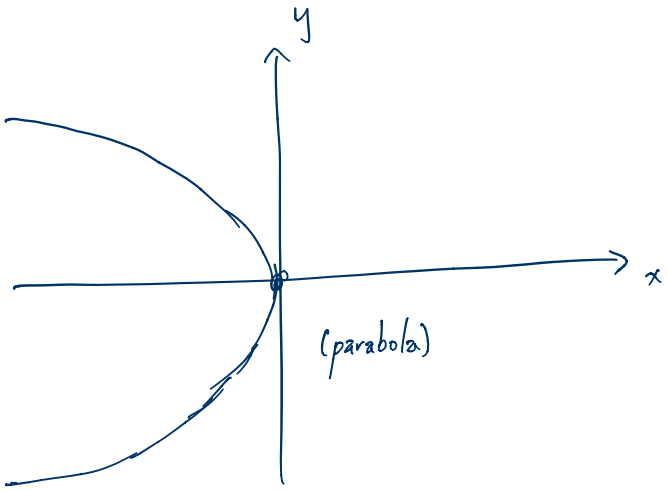
2. Find a Cartesian equation for the polar curve $r = -5\cot\theta\csc\theta$, and **sketch a picture** of it in the xy-plane.

$r = -5\,\frac{\cos\theta}{\sin\theta}\,\frac{1}{\sin\theta}$

$r\sin\theta = -5\,\frac{r\cos\theta}{r\sin\theta}$

$y = -5\,\frac{x}{y}$

$y^2 = -5x$



Cartesian equation: $y^2 = -5x$

(Continued on back.)

[*]These will only be judged for qualitative correctness.

3. The curve given by $x = \sin(2t)$, $y = \sin(3t + \sin(t))$ has two tangent lines at the point $(x, y) = (0, 0)$. Find their slopes.

Note that the curve repeats every 2π, so it suffices to consider the t-values at which $(x,y) = (0,0)$ such that $0 \le t < 2\pi$. Solving $\sin(2t) = 0$ gives $t = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}$.

But of these values of t, $\sin(3t + \sin(t))$ is only 0 for $t = 0, \pi$, not for $\frac{\pi}{2}$ and $\frac{3\pi}{2}$.

So we need to compute $\left.\frac{dy}{dx}\right|_{t=0}$ and $\left.\frac{dy}{dx}\right|_{t=\pi}$.

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{\cos(3t+\sin t)\,(3+\cos t)}{\cos(2t)\,2}$$

② $t = 0$: $\dfrac{\cos(0+0)\,(3+\cos 0)}{\cos(0)\,2} = \dfrac{4}{2} = 2$

② $t = \pi$: $\dfrac{\cos(3\pi)\,(3+\cos\pi)}{\cos(2\pi)\,2} = \dfrac{(-1)(2)}{(1)(2)} = -1$

Final answers: 2 and -1

Feedback: If you have any feedback you'd like to share, please write it here. If there are any specific topics you are confused about, feel free to write them here as well.