Name: _____ Mark: _____ / 19

Mini-math Div 3/4: Friday, January 12, 2024 (9.1-9.6) - 20 minutes

1. (3 points) Write an equation for the line tangent to the curve defined by $r(t) = \langle 2^t, 1/t \rangle$ at the point where $x = 8$.

2. (4 points) If $x(\theta) = \tan 2\theta$ and $y(\theta) = \sec 2\theta$, find the concavity at $\theta = \pi/6$.

3. (2 points) Write down (but do not evaluate) an integral which represents the length of the curve described by the parametric equations $x = t^3/3$ and $y = t^2/2$ from $t = 0$ to $t = 1$. (Extra challenge: find the exact value.)

4. (3 points) If f is a vector-valued function defined by $f(t) = \langle 2\sin t, \cos 2t\rangle$, then what is $f''(\pi/3)$?

5. (3 points) Find the vector-valued function $f(t)$ that satisfies the initial conditions $f(1) = \langle 4, 5\rangle$, and $f'(t) = \langle 6t, 7\rangle$.

6. (4 points) (Calculator-active) At time $t \geq 0$, a particle moving in the xy-plane has velocity vector given by $v(t) = \langle \sin(t^2), 2^{\sqrt{t}}\rangle$. If the particle is at point $(-3, 1)$ at time $t = 0$, how far is the particle from the origin at time $t = 3$?