Name: _____

Mark: _____ / 19

Mini-math Div 3/4: Friday, January 10, 2025 (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 $t \ge 0$, 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?