

Name: \_\_\_\_\_

Mark: \_\_\_\_\_ / 19

Mini-math Div 3/4: Friday, January 9, 2026 (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  $t = 3$ ?