

Section 10.1

Eliminate the parameter to find a Cartesian equation of the curve. Do not sketch the curve.

1. $x = \frac{1}{2} \cos(t), y = 2\sin(t)$

2. $x = \tan^2(t), y = \sec(t)$

3. $x = e^t - 1, y = e^{2t}$

4. $x = \sqrt{t+1}, y = \sqrt{t-1}$

Set up a table of values for t , x , and y , and sketch the curve in the x - y -plane. Use arrows to show the direction in which the curve is traced.

5. $x = t^2 + 1, y = t - 1, -2 \leq t \leq 2$

6. $x = 2t, y = \cos(\pi t), 0 \leq t \leq 2$

Section 10.2

7. Consider the parametric equations $x = \frac{3}{t}$ and $y = t^2 - 6t$, for $t \geq 1$.

a) Find the first derivative, $\frac{dy}{dx}$ and simplify.

b) Write the equation of the tangent line for $t = 2$.

c) Determine where the tangent line is horizontal and where it is vertical.

d) Find the second derivative, $\frac{d^2y}{dx^2}$.

e) Determine the intervals of concavity for the curve.

f) Use the information above and a table of values for t , x , and y , and sketch the curve in the x - y -plane. (Hint: for t use integers)

8. Consider the curve given by $x = t^2$ and $y = t^2 - 2t$, $t \geq 0$.
- Set up a table of values for t , x , and y , and sketch the curve in the x - y -plane, especially where it creates a pocket with the x -axis.
 - Find the area of the region enclosed between the x -axis and the curve.
 - Set up the integral, and simplify the integrand (but do not solve) for the arc length of the curve from $0 \leq t \leq 2$.

Section 10.3

Sketch the curve with the given polar equation by first sketching the graph of r as a function of θ in the Cartesian coordinate system.

9. $r = 1 + 2 \cos \theta$

10. For the polar equation in #9, find $\frac{dy}{dx}$ and identify the slope of the tangent lines at the origin.

Sketch the curve with the given polar equation by first sketching the graph of r as a function of θ in the Cartesian coordinate system.

11. $r = 3 \sin(2\theta)$

Section 10.4, Area

12. Sketch the curve and find the area that it encloses.

$$r = 1 - \cos \theta$$

13. Find the area of the region enclosed by one loop of the curve.
(Hint: Sketch enough to create one loop.)

$$r = 4 \sin(4\theta)$$

Section 10.3

14. Find the Cartesian equation for the curve defined by $r = \tan \theta \sec \theta$