Assignment 9-1

Using these parametric equations, eliminate the parameter to write the corresponding rectangular equation. Sketch the curve indicating the orientation without using a calculator.

1. $x=2t-3,\ y=\frac{2}{3}t+4$ 2. $x=t^3,\ y=t^2$ 3. $x=\sqrt{t},\ y=4-t$ 4. $x=t^4,\ y=4\ln t$

5. Use a calculator set in parametric mode to graph the curve represented by the parametric equations $x=-3+4\cos\theta$ and $y=1+2\sin\theta$. Then eliminate the parameter.

6. *Given the parametric equations* $x=-2t+1$ *and* $y=t^3+3$:
   a. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$
   b. Find an equation of the tangent line when $t=1$.
   c. Use concavity to determine if the tangent line is above the curve or below the curve.

7. Given the parametric equations $x=3\cos\theta$ and $y=3\sin\theta$:
   a. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.
   b. Find an equation of the tangent line when $\theta=\frac{\pi}{4}$.
   c. Use concavity to determine if the tangent line is above the curve or below the curve.

8. Use a calculator to graph the curve represented by the parametric equations $x=3\sin(2t)$ and $y=2\sin t$. The curve crosses itself at the point $(0,0)$. Find equations of all tangent lines at that point.

Without using a calculator, find all points at which each curve has horizontal and vertical tangents.

9. $x=2t+1,\ y=t^2$ 10. $x=t^2+1,\ y=t^2+4t$
11. $x=t^2-t+3,\ y=4t^3-12t$ 12. $x=\tan\theta,\ y=\sec\theta$

Given the parametric equations $x=-3t-5$ and $y=t^3-12t+3$ (without using a calculator):

13. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ in terms of t.
14. Use the second derivative test to determine if the curve has a local maximum, a local minimum, or neither when $t=2$.
15. Use the second derivative test to determine if the curve has a local maximum, a local minimum, or neither at the point $(1,19)$.
16. Use the second derivative test to determine if the curve has a local maximum, a local minimum, or neither at the point $(-8,-8)$.

Show an integral setup and find the length of each arc on the given interval.

17. $x=3t-t^2,\ y=4t^{\frac{3}{2}}\quad 1\le t\le 2$ 18. $x=t+\cos t,\ y=t-\sin t\quad 0\le t\le\pi$
19. $x=\arccos t,\ y=\ln\sqrt{1+t^2}\quad 0\le t\le\frac{1}{2}$