

I. Use our *analysis of intervals* technique to sketch the graphs of the following:

1. $x = t^2 + 3$
 $y = 2t^3 - 54t$

2. $x = t^2 - 4$
 $y = 4t^3 + 6t^2 - 24t$

3. $x = t^2 + 3$
 $y = 2t^3 - 54t$

4. $x = t^2 - 4$
 $y = 4t^3 + 6t^2 - 24t$

II. Answer the following:

1. Consider the parametric equations:

$$x = 3t^2$$
$$y = t^3 - 3t$$

- i) Clearly sketch the graph of this curve (use our *analysis of intervals* technique).
- ii) Determine the coordinates of the points on this curve where the tangent lines are horizontal and the coordinates of the points where the tangent lines are vertical.
- iii) Determine the slope of the tangent lines where the curve crosses the x -axis.
- iv) Determine the area enclosed by the closed loop in the graph.
- v) Determine the length of the loop described above.

2. If $x = t \sin t$ and $y = t \cos t$, then determine the equation of the tangent line at $t = \frac{\pi}{2}$