

1. Sketch with direction of the following parametric equations:

a)
$$\begin{cases} x = 2 \cos(t) + 3 \\ y = \sin(t) - 1 \end{cases}; t \in R$$

b)
$$\begin{cases} x = 3 \sin^2(t) - 1 \\ y = 2 \cos(t) + 1 \end{cases}; t \in R$$

2. Determine equation of tangent line to the curve:

a)
$$\begin{cases} x = -\sqrt{t+1} \\ y = \sqrt{3t} \end{cases}; \text{ at } t = 3$$

b)
$$\begin{cases} x = \sec^2 t - 1 \\ y = \tan t \end{cases}; \text{ at } t = -\frac{\pi}{4}$$

3. Determine point(s) where tangent lines to the curve is vertical / horizontal.

a)
$$\begin{cases} x = t^3 - 5t^2 + 3t + 1 \\ y = t^3 + \frac{13}{2}t^2 - 10t - 1 \end{cases}; t \in R$$

b)
$$\begin{cases} x = \cos(2t) + t + 2 \\ y = 2\sin(3t) - 3\sqrt{3}t + 1 \end{cases}; t \in R$$

4. Find the arc-length of the following curves:

a)
$$\begin{cases} x = \frac{t^2}{2} \\ y = \frac{(2t+1)^{3/2}}{3} \end{cases} ; \text{ for } 0 \leq t \leq \sqrt{3}$$

b)
$$\begin{cases} x = 8 \cos t + 8t \sin t \\ y = 8 \sin t - 8t \cos t \end{cases}; 0 \leq t \leq \frac{\pi}{2}$$

5. Find areas of the surfaces generated by revolving the curves about the indicated axes

a)
$$\begin{cases} x = t + \sqrt{2} \\ y = \frac{t^2}{2} + \sqrt{2}t \end{cases}; -\sqrt{2} \leq t \leq \sqrt{2} \text{ about the } y\text{-axis}$$

b)
$$\begin{cases} x = \ln(\sec t + \tan t) - \sin t \\ y = \cos t \end{cases}; 0 \leq t \leq \frac{\pi}{3} \text{ about the } x\text{-axis}$$