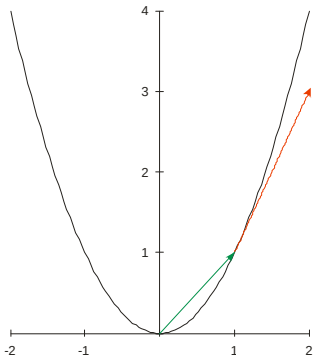
Slopes and Tangents of Parametric Curves (Section 3.9)

Suppose a curve C is given by the parametric equations

$$x = x(t) \quad y = t(t)$$



$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{y'(t)}{x'(t)} = \frac{dy/dt}{dx/dt} = \frac{dy}{dx}$$

EXAMPLE 1

Find an equation of the tangent to the curve at the point corresponding to the given value of the parameter.

$$x = 1 - t^3,\ y = t^2 - 3t,\ t = 1$$

$$x = 2\sin\theta,\ y = 3\cos\theta,\ \theta = \pi/4$$

$$\boldsymbol{r}(t) = \cos t\ \boldsymbol{i} + \tan t\ \boldsymbol{j},\ t = \pi/4$$

EXAMPLE 2

Find the point(s) on the curve where the tangent line is horizontal or vertical

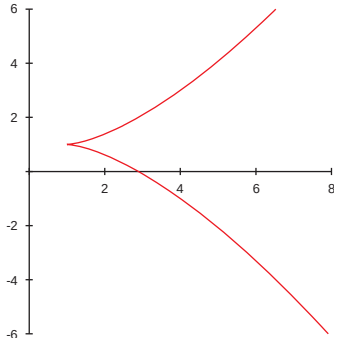
$x = t^3 - 3t^2,\ y = t^3 - 3t$

$x = \sin 2t,\ y = \sin t$

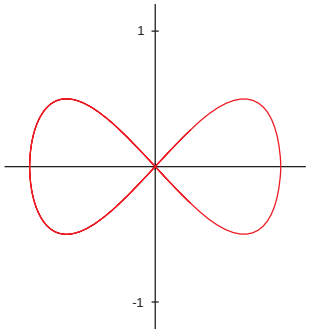
EXAMPLE 3

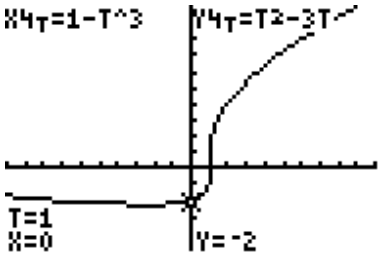
Find equations of the tangents to the curve that pass through the given point

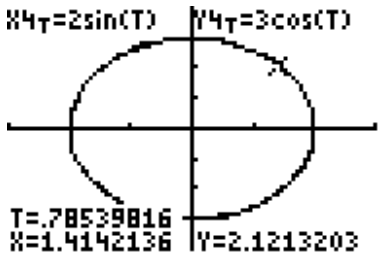
$x = 3t^2 + 1 \quad y = 2t^3 + 1 \quad (4,3)$

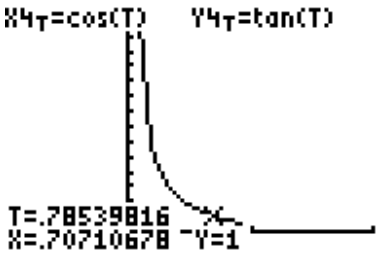


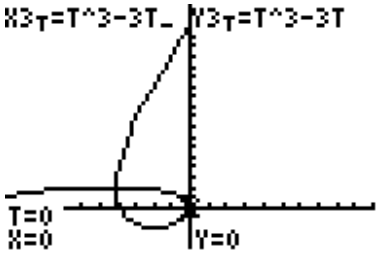
$x = \cos t \quad y = \sin t \cos t \quad (0,0)$

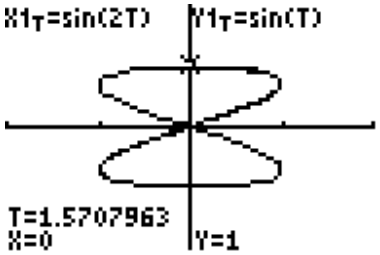



X4T=1-T^3
Y4T=T^2-3T
T=1
X=0
Y=-2


X4T=2sin(T)
Y4T=3cos(T)
T=.78539816
X=1.4142136
Y=2.1213203


X4T=cos(T)
Y4T=tan(T)
T=.78539816
X=.70710678
Y=1


X3T=T^3-3T
Y3T=T^3-3T
T=0
X=0
Y=0


X1T=sin(2T)
Y1T=sin(T)
T=1.5707963
X=0
Y=1