Exercicis

5. Consider the circle C of radius 2, centered at the origin.

(a) Find a parametrization for C inducing a counterclockwise orientation and starting at $(2, 0)$.

(b) Find a parametrization for C inducing a clockwise orientation and starting at $(0, 2)$.

(c) Find a parametrization for C if it is now centered at the point $(4, 7)$.

6. Give a parametrization for each of the following curves:

(a) The line passing through $(1, 2, 3)$ and $(-2, 0, 7)$

(b) The graph of $f(x) = x^2$

(c) The square with vertices $(0, 0)$, $(0, 1)$, $(1, 1)$, and $(1, 0)$ (Break it up into line segments.)

(d) The ellipse given by $\frac{x^2}{9} + \frac{y^2}{25} = 1$

In **11** to **14**, compute the tangent vectors to the given paths:

11. $\mathbf{c}(t) = (e^t, \cos t)$

12. $\mathbf{c}(t) = (3t^2, t^3)$

13. $\mathbf{c}(t) = (t \sin t, 4t)$

14. $\mathbf{c}(t) = (t^2, e^2)$

15. When is the velocity vector of a point on the rim of a rolling wheel *horizontal*? What is the speed at this point?

16. If the position of a particle in space is $(6t, 3t^2, t^3)$ at time t, what is its velocity vector at $t = 0$?

In **17** and **18**, determine the equation of the tangent line of the curve at the specified point:

17. $(\sin 3t, \cos 3t, 2t^{5/2})$; $t = 1$

18. $(\cos^2 t, 3t - t^3, t)$; $t = 0$

24. Consider the spiral given by $\mathbf{c}(t) = (e^t \cos(t), e^t \sin(t))$. Show that the angle between $\mathbf{c}$ and $\mathbf{c}'$ is constant.

25. Let $\mathbf{c}(t) = (t^3, t^2, 2t)$ and $f(x, y, z) = (x^2 - y^2, 2xy, z^2)$.

(a) Find $(f \circ \mathbf{c})(t)$.

(b) Find a parametrization for the tangent line to the curve $f \circ \mathbf{c}$ at $t = 1$.