Section 13.1 - Vector Functions & Space Curves

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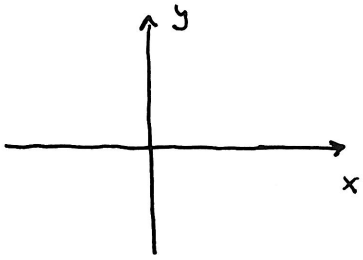
- Vector Functions:

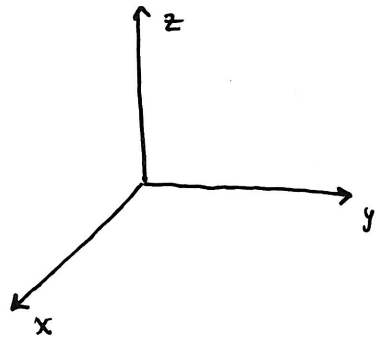


- $\lim_{t \to a} \vec{r}(t) =$

- $\vec{r}(t)$ is <u>continuous</u> at $t=a$ if

Example 2 Find $\lim_{t \to 0} \vec{r}(t)$ where $\vec{r}(t) = (1+t^3)\vec{i} + te^{-t}\vec{j} + \frac{\sin t}{t}\vec{k}$

- A <u>space curve</u> C



Example 4 Sketch the curve whose vector equation is $\vec{r}(t) = \langle \cos t, \sin t, t \rangle$

Question: How can Ex. 4 be changed to spiral clockwise?

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Example 5 Find a vector equation and parametric equations for the line segment that joins the point $P(1,3,-2)$ to $Q(2,-1,3)$.

Example 6 Find a vector function that represents the curve of intersection of the cylinder $x^2+y^2=1$ and the plane $y+z=2$.

Example Use a computer to graph the Toroidal Spiral

$$x=(2+\sin 20t)\cos t \qquad y=(4+\sin 20t)\sin t \qquad z=\cos 20t$$

→ Wolframalpha.com

→ math.uri.edu/~bkaskosz/flashmo/parcur/

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- Extra Examples

#27 Show that the curve: $x = t\cos t$, $y = t\sin t$, $z = t$ lies on the cone $z^2 = x^2 + y^2$ and use that to help sketch the curve.

#41 Find the vector function that represent the cure of intersection of the cone $z = \sqrt{x^2 + y^2}$ and the plane $z = 1 + y$.

#48. Two particles travel along the space curves:

$\vec{r}_1(t) = \langle t, t^2, t^3 \rangle$ and $\vec{r}_2(t) = \langle 1 + 2t, 1 + 6t, 1 + 14t \rangle$

Do the particles collide? Do their paths intersect?

★ Cool: Watch video on space filling curves: youtube.com/watch?v=RU0wSclj360