

Lesson 8

Vector Functions and Space Curves

Initializations

```
> restart;  
with(VectorCalculus):  
BasisFormat(false):  
with(plots):  
with(oneonta):  
setoptions3d(axes=boxed):  
>
```

8.1 Vector Functions and Space Curves

Examples

Example 8.1.1

Define and plot the helix

$$\mathbf{r}(t) = \langle \cos t, \sin t, t \rangle$$

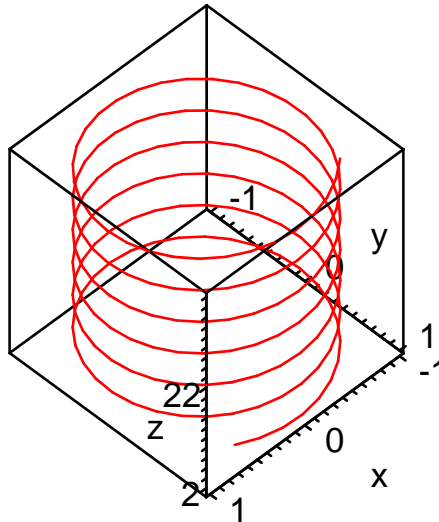
Solution

Code the helix as a Maple vector and use the **spacecurve** command to generate the plot.

```
> r:=<cos(t), sin(t), t>;
```

$$r := \begin{bmatrix} \cos(t) \\ \sin(t) \\ t \end{bmatrix} \quad (2.1.1.1)$$

```
> spacecurve(r, t=1..40, color=red, numpoints=200, axes=  
boxed, labels=[x, y, z]);
```



>

Example 8.1.2

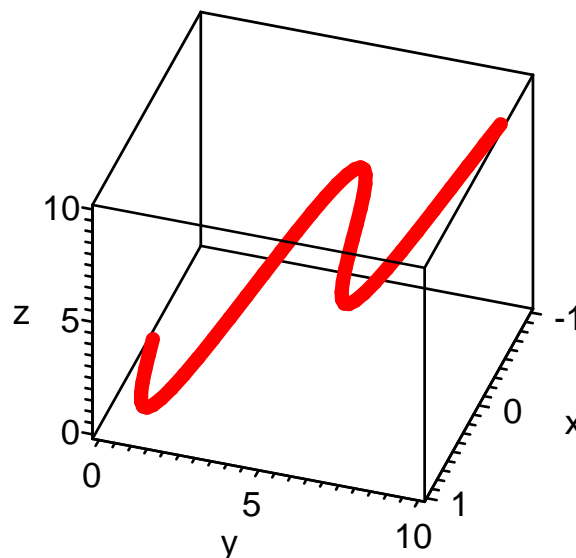
Plot the space curve $r(t) = \langle \sin t, t, t \rangle$ and show it is the curve of intersection of the the surfaces $x = \sin z$ and $y = z$.

Solution

First, we plot the space curve.

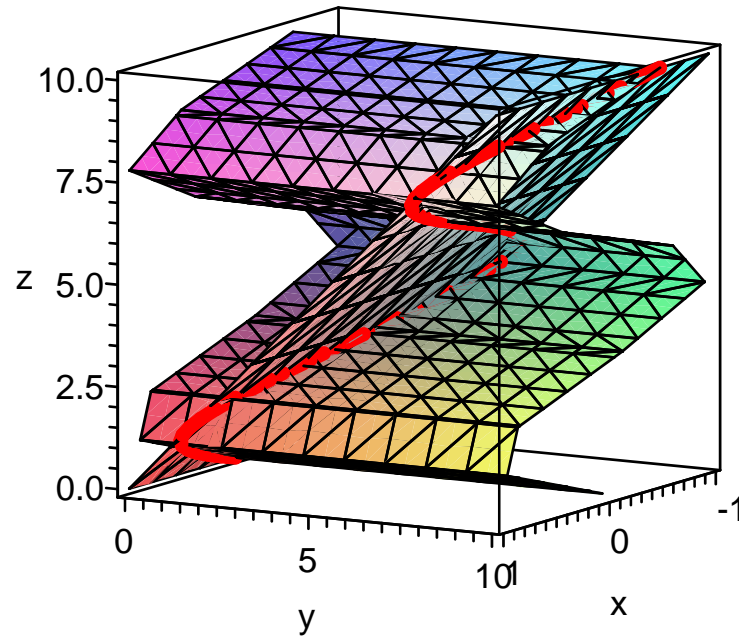
```
> r:=<sin(t), t, t>;
p1:=spacecurve(r, t=0..10, color=red, thickness=4):
display(p1, labels=[x,y,z], orientation=[18, 49]);
```

$$r := \begin{bmatrix} \sin(t) \\ t \\ t \end{bmatrix}$$



Next we plot the given surfaces and merge the images.

```
> p2:=implicitplot3d({x=sin(z), y=z}, x=-1..1,y=0..10, z=0..10):  
display([p1, p2], labels=[x,y,z], orientation=[30, 80]);
```



```
>
```