

```
> restart;
```

```
> # Computing the area enclosed by a parametric curve
```

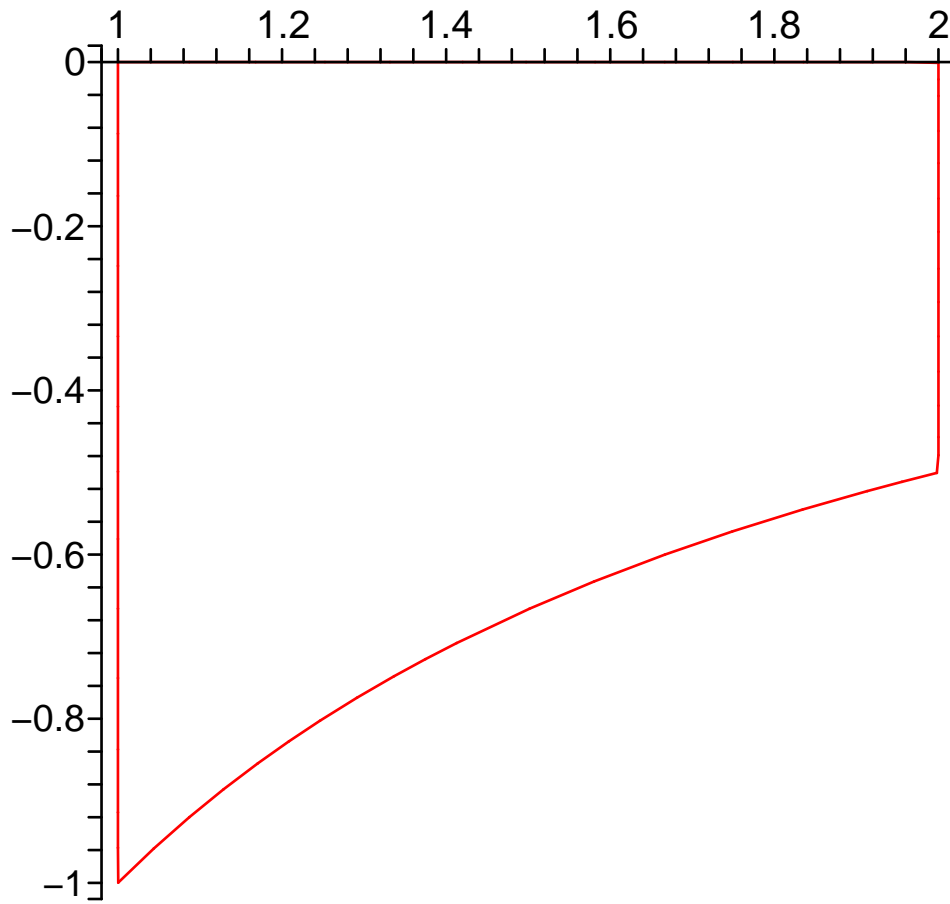
```
> f:=piecewise(0<=t and t<1,1,  
              1<=t and t<2,t,  
              2<=t and t<3,2,  
              3<=t and t<=4,5-t);
```

$$f := \begin{cases} 1 & 0 \leq t \text{ and } t < 1 \\ t & 1 \leq t \text{ and } t < 2 \\ 2 & 2 \leq t \text{ and } t < 3 \\ 5 - t & 3 \leq t \text{ and } t \leq 4 \end{cases}$$

```
> g:=piecewise(0<=t and t<1,-t,  
              1<=t and t<2,-1/t,  
              2<=t and t<3,-(3-t)/2,  
              3<=t and t<=4,0);
```

$$g := \begin{cases} -t & 0 \leq t \text{ and } t < 1 \\ -\frac{1}{t} & 1 \leq t \text{ and } t < 2 \\ -\frac{3}{2} + \frac{1}{2}t & 2 \leq t \text{ and } t < 3 \\ 0 & 3 \leq t \text{ and } t \leq 4 \end{cases}$$

```
> plot([f,g,t=0..4]);
```



```
> A1:=-int(-1/x,x=1..2);
```

```
A1 := ln(2)
```

```
> df:=diff(f,t);
```

$$df := \begin{cases} 0 & t < 0 \\ \text{undefined} & t = 0 \\ 0 & t < 1 \\ \text{undefined} & t = 1 \\ 1 & t < 2 \\ \text{undefined} & t = 2 \\ 0 & t < 3 \\ \text{undefined} & t = 3 \\ -1 & t < 4 \\ \text{undefined} & t = 4 \\ 0 & 4 < t \end{cases}$$

```
> A2:=-int(df*g,t=0..4);
```

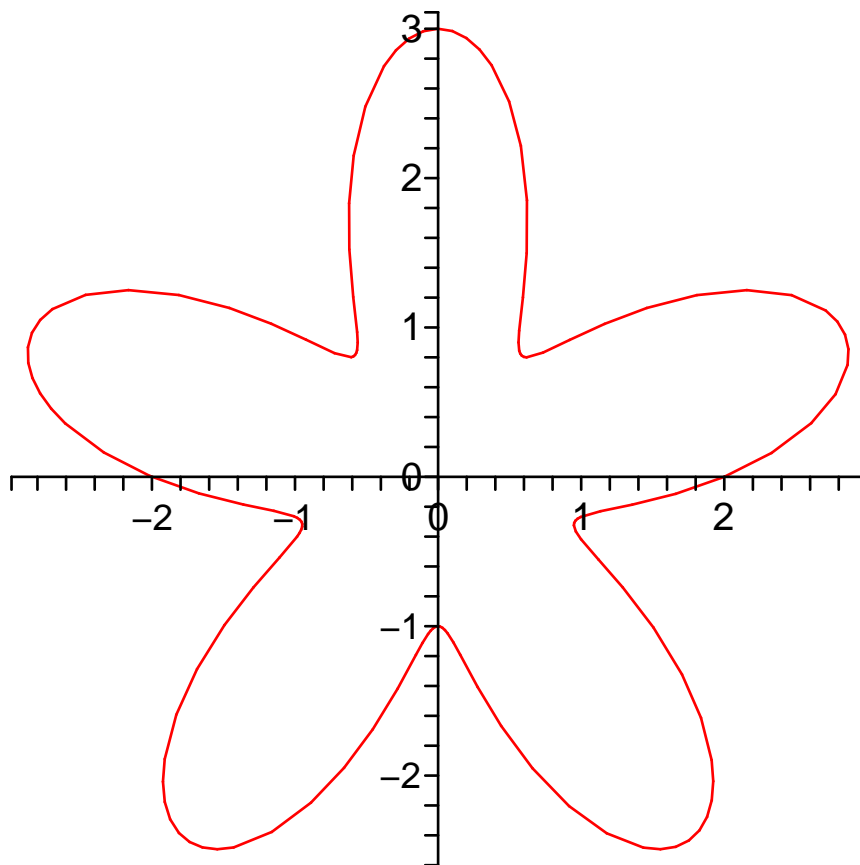
```
A2 := ln(2)
```

```
> f:=cos(t)*(2+sin(5*t));  
> g:=sin(t)*(2+sin(5*t));
```

$$f := \cos(t) (2 + \sin(5 t))$$

$$g := \sin(t) (2 + \sin(5 t))$$

```
> plot([f,g,t=0..2*Pi]);
```



```
> dg:=diff(g,t);
```

$$dg := \cos(t) (2 + \sin(5 t)) + 5 \sin(t) \cos(5 t)$$

```
> A1:=Int(dg*f,t=0..2*Pi);
```

$$A1 := \int_0^{2\pi} (\cos(t) (2 + \sin(5 t)) + 5 \sin(t) \cos(5 t)) \cos(t) (2 + \sin(5 t)) dt$$

```
> value(A1);
```

$$\frac{9}{2} \pi$$

```
> evalf(A1);
```

14.13716694

```
> df:=diff(f,t);
```

$$df := -\sin(t) (2 + \sin(5 t)) + 5 \cos(t) \cos(5 t)$$

```
> A2:=-int(df*g,t=0..2*Pi);
```

$$A2 := \frac{9}{2} \pi$$

```
>
```