H2T15R

Laske $\int_0^{2\cdot\pi} \frac{\cos(x)}{13 - 12\cdot\cos(2\cdot x)}\,dx$

a) symbolisesti, b) numeerisesti

```
> f := x -> cos(x)/(13 - 12*cos(2*x))
```

$$f := x \to \frac{\cos(x)}{13 - 12\cos(2x)} \quad (1)$$

```
> int(f(x), x)
```

$$\frac{1}{12}\sqrt{6}\,\arctan\left(2\sin(x)\sqrt{6}\right) \quad (2)$$

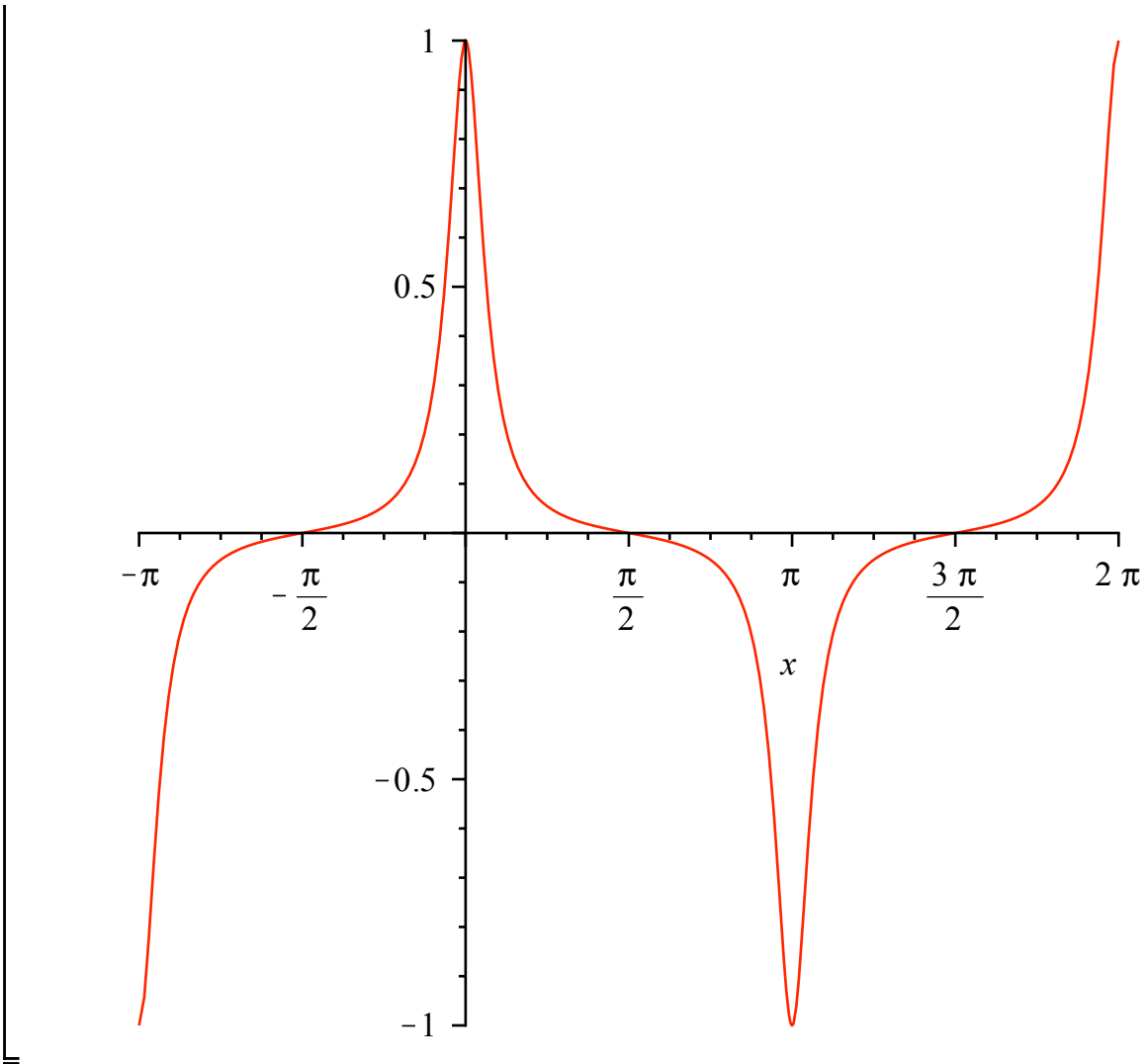
```
> int(f(x), x = 0..2*Pi)
```

$$0 \quad (3)$$

```
> int(f(x), x = 0..2*Pi, numeric)
```

$$-1.795902271\ 10^{-10} \quad (4)$$

```
> plot(f(x), x = -Pi..2*Pi)
```



> $f\left(\frac{\mathrm{Pi}}{2}-a\right)+f\left(\frac{\mathrm{Pi}}{2}+a\right)$

0 **(5)**

Matlab

> $f := x \rightarrow \frac{\cos(x)}{13-12\cdot\cos(2\cdot x)}$

***Matlab* :**

```
>> f=@(x) cos(x)./(13-12*cos(2*x))

f =
    @(x)cos(x)./(13-12*cos(2*x))
```

```
>> fplot(f,[0 2*pi]);shg
>> help quad
>> help quadl
>> quad(f,0 ,2*pi)
ans =
   1.8705e-06

>> tol=1e-10;quad(f,9,2*pi,tol)

ans =

   -0.2268

>> tol=1e-10;quad(f,0,2*pi,tol)
ans =
   3.9262e-11
>> tol=1e-12;quad(f,0,2*pi,tol)
ans =
  -6.3838e-15
>> tol=eps;quad(f,0,2*pi,tol)
Warning: Maximum function count exceeded; singularity likely.
> In quad at 107
ans =
   -0.0087       % quad ei selviä minimtoleranssilla, onneksi varoittaa
                 % Lasketaan tarkemmalla menetelmällä (funktio quadl)
>> tol=eps
>> quadl(f,0,2*pi,tol)
tol =
   2.2204e-16

ans =
  -2.7756e-16
```