Reziduova veta

Chci spocitat realny integral (od minus-nekonecna do plus-nekonecna) z funkce f==(2x^3+13x*sin(x))/(x^4+13*x^2+36).Spoctu tento integral pomoci reziduove vety.

```
> funkce:=x->(2*x^3+13*x*sin(x))/(x^4+13*x^2+36);
```

$$funkce := x \rightarrow \frac{2\,x^3 + 13\,x\,\sin(x)}{x^4 + 13\,x^2 + 36}$$

```
> int((2*x^3+13*x*sin(x))/(x^4+13*x^2+36),x=-infinity..infinity);
```

$$undefined$$

```
> evalf(%);
```

$$\mathrm{Float}(undefined)$$

Prikaz int v tomto pripade nefunguje.

Zvolim integracni funkci (2*z^3+13z*e^(iz))/(z^4+13z^2+36).Budu integrovat pres pulkruznici .Pres oblouk pulkruznici se da ukazat ze, integral se blizi nule ,jestlize se polomer pulkruznice bude blizit k nekonecnu.Integral pres uzavrenou krivku(pulkruznici) je pak roven integralu pres "usecku pulkruznice" od minus-nekonecna do plus-nekonecna.Muj hledany integral vzhledem k integracni funkci bude imaginarni cast tohoto integralu.

```
> Poly:=[solve(z^4+13*z^2+36=0,z)];
```

$$Poly := [2\,I, -2\,I, 3\,I, -3\,I]$$

Pomoci pravidel na vypocet rezidui zjistim ,ze reziduum se spocte dosazenim polu do funkce FR=(2z^3+13z*e^(iz))/(4z^3+26z).

```
> FR:=z->(2*z^3+13*z*exp(I*z))/(4*z^3+26*z);
```

$$FR := z \rightarrow \frac{2\,z^3 + 13\,z\,\mathbf{e}^{(z\,I)}}{4\,z^3 + 26\,z}$$

```
> FR(2*I);
```

$$\frac{-1}{20}\,I\,(-16\,I + 26\,I\,\mathbf{e}^{(-2)})$$

```
> Rezidum_prvni:=simplify(%);
```

$$Rezidum\_prvni := -\frac{1}{10}\,(8\,\mathbf{e}^2 - 13)\,\mathbf{e}^{(-2)}$$

```
> FR(3*I);
```

$$\frac{1}{30} I \left(-54\, I + 39\, I\, \mathbf{e}^{(-3)}\right)$$

```
> Rezidum_druhy:=simplify(%);
```

$$Rezidum\_druhy := \frac{1}{10} \left(18\, \mathbf{e}^{3} - 13\right) \mathbf{e}^{(-3)}$$

```
> soucet_rezidui:=Rezidum_prvni+Rezidum_druhy;
```

$$soucet\_rezidui := -\frac{1}{10} \left(8\, \mathbf{e}^{2} - 13\right) \mathbf{e}^{(-2)} + \frac{1}{10} \left(18\, \mathbf{e}^{3} - 13\right) \mathbf{e}^{(-3)}$$

```
> Integral:=Im(2*Pi*I*(soucet_rezidui));
```

$$Integral := 2\,\pi \left(\left(-\frac{4}{5}\, \mathbf{e}^{2} + \frac{13}{10} \right) \mathbf{e}^{(-2)} + \left(\frac{9}{5}\, \mathbf{e}^{3} - \frac{13}{10} \right) \mathbf{e}^{(-3)} \right)$$

```
> evalf(Integral);
```

$$6.981955178$$

```
>
>
```