Analiza z zastosowaniem Maple'a

Liczby calkowite

```
> 100!;
```

93326215443944152681699238856266700490715968264381621\
46859296389521759999322991560894146397615651828\
62536979208272237582511852109168640000000000000000\
000000000

```
> ifactor(%);
```

$$(2)^{97}\,(3)^{48}\,(5)^{24}\,(7)^{16}\,(11)^{9}\,(13)^{7}\,(17)^{5}\,(19)^{5}\,(23)^{4}\,(29)^{3}\,(31)^{3}\,(37)^{2}\,(41)^{2}\,(43)^{2}\,(47)^{2}\,(53)\,(59)\,(61)\,(67)\,(71)\,(73)\,(79)\,(83)\,(89)\,(97)$$

```
> isprime(2^47 - 1);
```

false

```
> nextprime(2^47 - 1);
```

140737488355333

```
> ithprime(2000);
```

17389

```
> igcd(3^50, 5^300 - 1);
```

9

```
> 2^(2^7);
```

340282366920938463463374607431768211456

Liczby wymierne

```
> 1/4 + 1/6;
```

$$\frac{5}{12}$$

```
> 16/45 * 35/2;
```

$$\frac{56}{9}$$

Liczby rzeczywiste

```
> sqrt(3);
```

$$\sqrt{3}$$

```
> whattype(%);
```

^

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

$$1.732050808$$

```
> whattype(%);
```

$$\mathit{float}$$

```
> evalf(Pi, 100);
```

3.141592653589793238462643383279502884197169399375105 8 \
20974944592307816406286208998628034825342117068

```
> Digits := 30;
```

$$\mathit{Digits} := 30$$

```
> evalf(Pi);
```

$$3.14159265358979323846264338328$$

```
> Digits := 10;
```

$$\mathit{Digits} := 10$$

```
> evalf(Pi);
```

$$3.141592654$$

```
> sin(Pi/12);
```

$$\sin\left(\frac{1}{12}\pi\right)$$

```
> arcsinh(1);
```

$$\ln(1+\sqrt{2})$$

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

$$0.8813735869$$

```
> arcsinh(1.);
```

$$0.8813735870$$

```
> convert(arcsinh(1), ln);
```

$$\ln(1+\sqrt{2})$$

```
> exp(%);
```

$$1+\sqrt{2}$$

Liczby zespolone

```
> (1 + 3*I) * (3 - 4*I);
```

$$15+5\,I$$

```
> (%)^(-1);
```

$$\frac{3}{50} - \frac{1}{50}\,\mathrm{I}$$

```
> evalf(exp(I));
```

$$0.5403023059 + 0.8414709848\,\mathrm{I}$$

```
> evalc(polar(sqrt(2), Pi/4));
```

$$1 + \mathrm{I}$$

```
> sin(1 + I);
```

$$\sin(1 + \mathrm{I})$$

```
> evalc(%);
```

$$\sin(1)\cosh(1) + \mathrm{I}\cos(1)\sinh(1)$$

```
> evalc(conjugate(exp(Pi/2 * (1 + I))));
```

$$-\mathrm{I}\,\mathrm{e}^{\left(\frac{1}{2}\pi\right)}$$

Sumy i iloczyny

```
> Sum(cos(i * theta), i = 0..n) = sum(cos(i * theta), i = 0..n);
```

$$\sum_{i=0}^{n} \cos(i\,\theta) = -\frac{1}{2}\,\frac{\sin(\theta)\sin((n+1)\,\theta)}{\cos(\theta) - 1} - \frac{1}{2}\cos((n+1)\,\theta) + \frac{1}{2}$$

```
> Sum(i^14, i = 1..n);
```

$$\sum_{i=1}^{n} i^{14}$$

```
> value(%);
```

$$\frac{1}{15}(n+1)^{15} - \frac{1}{2}(n+1)^{14} + \frac{7}{6}(n+1)^{13} - \frac{91}{30}(n+1)^{11} + \frac{143}{18}(n+1)^{9} - \frac{143}{10}(n+1)^{7} + \frac{91}{6}(n+1)^{5} - \frac{691}{90}(n+1)^{3} + \frac{7}{6}n + \frac{7}{6}$$

```
> simplify(%);
```

$$-\frac{691}{90} n^3 + \frac{91}{6} n^5 - \frac{143}{10} n^7 + \frac{143}{18} n^9 - \frac{91}{30} n^{11} + \frac{7}{6} n^{13} + \frac{1}{2} n^{14} + \frac{1}{15} n^{15} + \frac{7}{6} n$$

```
> factor(%);
```

$$\frac{1}{90} n (2 n + 1) (n + 1) (3 n^{12} + 18 n^{11} + 24 n^{10} - 45 n^9 - 81 n^8 + 144 n^7 + 182 n^6 - 345 n^5 - 217 n^4 + 498 n^3 + 44 n^2 - 315 n + 105)$$

```
> sum(1/i^3, i = 1..infinity);
```

$$\zeta(3)$$

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

$$1.202056903$$

```
> Sum(1/i^6, i = 1..infinity) = sum(1/i^6, i = 1..infinity);
```

$$\sum_{i=1}^{\infty} \frac{1}{i^6} = \frac{1}{945} \pi^6$$

```
> product(x, x = RootOf(x^3 - x + 2));
```

$$-2$$

```
> Product(k + n, k = 0..n-1) = product(k + n, k = 0..n-1);
```

$$\prod_{k=0}^{n-1} (k + n) = \frac{\Gamma(2 n)}{\Gamma(n)}$$

Przeksztalcanie wyrazen

normal

```
> A := x / (x^2 + 2 * x + 1) + 1 / x;
```

$$A := \frac{x}{x^2 + 2 x + 1} + \frac{1}{x}$$

```
> B := -1 / (x + 1)^2 + (2 * x + 1) / (x * (x + 1));
```

$$B := -\frac{1}{(x + 1)^2} + \frac{2 x + 1}{x (x + 1)}$$

```
> A - B;
```

$$\frac{x}{x^2+2x+1}+\frac{1}{x}+\frac{1}{(x+1)^2}-\frac{2x+1}{x(x+1)}$$

```
> normal(%);
```

$$0$$

```
> normal(A), normal(B);
```

$$\frac{2x^2+2x+1}{(x^2+2x+1)\,x},\ \frac{2x^2+2x+1}{(x+1)^2\,x}$$

```
> normal(A, expanded), normal(B, expanded);
```

$$\frac{2x^2+2x+1}{x^3+2x^2+x},\ \frac{2x^2+2x+1}{x^3+2x^2+x}$$

```
> A := 4 * cos(x)^2 * cos(2 * x) + 4 * sin(x)^2;
```

$$A := 4\cos(x)^2\cos(2x) + 4\sin(x)^2$$

```
> B := cos(4 * x) + 3;
```

$$B := \cos(4x) + 3$$

```
> simplify(A - B);
```

$$0$$

```
> testeq(A, B);
```

$$\mathit{true}$$

simplify

```
> A;
```

$$4\cos(x)^2\cos(2x) + 4\sin(x)^2$$

```
> simplify(A);
```

$$8\cos(x)^4 - 8\cos(x)^2 + 4$$

```
> A := exp(2 * x) * (sin(x)^4 + sin(x)^2 * cos(x)^2 - 1) /
(exp(x)^2 * (ln(x^3) - 2 * ln(x)));
```

$$A := \frac{e^{(2x)}\,(\sin(x)^4+\sin(x)^2\cos(x)^2-1)}{(e^x)^2\,(\ln(x^3)-2\ln(x))}$$

```
> simplify(A, trig);
```

$$-\frac{e^{(2x)}\cos(x)^2}{(e^x)^2\,(\ln(x^3)-2\ln(x))}$$

```
> simplify(A, ln, assume = positive);
```

$$\frac{e^{(2\,x)}\,(\sin(x)^4+\sin(x)^2\cos(x)^2-1)}{(e^x)^2\ln(x)}$$

```
> simplify(A, power);
```

$$\frac{\sin(x)^4+\sin(x)^2\cos(x)^2-1}{\ln(x^3)-2\ln(x)}$$

```
> simplify(A, power, trig);
```

$$-\frac{\cos(x)^2}{\ln(x^3)-2\ln(x)}$$

```
> simplify(A, assume = positive);
```

$$-\frac{\cos(x)^2}{\ln(x)}$$

```
> B := x + 1 + sqrt(x^4 + 2 * x^2 * y^2 + y^4);
```

$$B := x+1+\sqrt{(x^2+y^2)^2}$$

```
> simplify(B, assume = real);
```

$$x+1+x^2+y^2$$

```
> w := (1/2) * m * v^2 - exp(2) / (4 * Pi * epsilon * r);
```

$$w := \frac{1}{2}\,m\,v^2-\frac{1}{4}\,\frac{e^2}{\pi\,\varepsilon\,r}$$

```
> m * v^2 / r = exp(2) / (4 * Pi * epsilon * r^2);
```

$$\frac{m\,v^2}{r}=\frac{1}{4}\,\frac{e^2}{\pi\,\varepsilon\,r^2}$$

```
> eq := numer(lhs(%) - rhs(%)) = 0;
```

$$eq := 4\,m\,v^2\,\pi\,\varepsilon\,r-e^2=0$$

```
> simplify(w, {eq}, {r});
```

$$-\frac{1}{2}\,m\,v^2$$

```
> simplify(w, {eq}, {v});
```

$$-\frac{1}{8}\,\frac{e^2}{\pi\,\varepsilon\,r}$$

expand

```
> expand(x * (x - 1)^3 + 2 * x);
```

$$x^4 - 3x^3 + 3x^2 + x$$

```
> expand(sin(3 * x));
```

$$4\sin(x)\cos(x)^2 - \sin(x)$$

```
> expand(ln((x - 1) * (x + 1)));
```

$$\ln((x-1)(x+1))$$

```
> expand((x^2 + 1) / (x + 3));
```

$$\frac{x^2}{x+3} + \frac{1}{x+3}$$

combine

```
> A := Int(f(x), x = a..b): B := Int(g(x), x = a..b): A + B;
```

$$\int_a^b f(x)\,\mathrm{d}x + \int_a^b g(x)\,\mathrm{d}x$$

```
> combine(A + B);
```

$$\int_a^b f(x) + g(x)\,\mathrm{d}x$$

```
> combine(sin(a) * cos(b) + cos(a) * sin(b), trig);
```

$$\sin(a+b)$$

```
> combine(sin(x)^10, trig);
```

$$\frac{63}{256} - \frac{1}{512}\cos(10x) + \frac{5}{256}\cos(8x) - \frac{45}{512}\cos(6x) + \frac{15}{64}\cos(4x) - \frac{105}{256}\cos(2x)$$

```
> combine(3 * ln(a) + 2 * ln(b), ln);
```

$$3\ln(a) + 2\ln(b)$$

convert

```
> convert(12345, binary);
```

$$11000000111001$$

```
> convert(1.234, fraction);
```

$$\frac{617}{500}$$

```
> convert(x^3 / (x^3 - 1), parfrac, x);
```

$$1 + \frac{1}{3} \frac{1}{x - 1} - \frac{1}{3} \frac{2 + x}{x^2 + x + 1}$$

```
> convert(sin(2 * x), exp);
```

$$-\frac{1}{2} \mathrm{I} \; ? \mathrm{e}^{(2 \mathrm{I} x)} - \frac{1}{\mathrm{e}^{(2 \mathrm{I} x)}} ?$$

```
> convert(a + b + c, `*`);
```

$$a\, b\, c$$

```
>
```