

1

```
> eq1:=cos(2*x)-cos(x)^2;
eq2:=diff(eq1,x);
combine(eq2);
```

$$\begin{aligned} eq1 &:= \cos(2x) - \cos(x)^2 \\ eq2 &:= -2 \sin(2x) + 2 \cos(x) \sin(x) \\ &\quad - \sin(2x) \end{aligned}$$

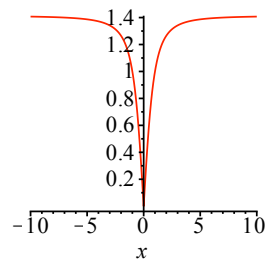
(1.1)

```
> eq3:=sqrt((x^2-1)/(x^2+1)+1);
```

$$eq3 := \sqrt{\frac{x^2-1}{x^2+1} + 1}$$

(1.2)

```
> plot(eq3,x=-10..10);
```



2

```
> 1/(exp(2*x)-2*exp(x));
```

$$\frac{1}{e^{2x} - 2e^x}$$

(2.1)

```
> int(%x);
```

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

(2.2)

```
> x^n*ln(x);
```

$$x^n \ln(x)$$

(2.3)

```
> int(x^n*ln(x),x=1..2);
```

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

(2.4)

3

```
> with(LinearAlgebra);
```

```
> A:=Matrix([[1,-1,-1],[-1,2,2],[2,1,2]]);
```

$$A := \begin{bmatrix} 1 & -1 & -1 \\ -1 & 2 & 2 \\ 2 & 1 & 2 \end{bmatrix}$$

(3.1)

```
> Ai:=MatrixInverse(A);
```

$$Ai := \begin{bmatrix} 2 & 1 & 0 \\ 6 & 4 & -1 \\ -5 & -3 & 1 \end{bmatrix}$$

(3.2)

```
> Ai.A;
```

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

(3.3)

```
> B:=Matrix([[1,-1,0],[-1,2,2],[0,2,1]]);
```

$$B := \begin{bmatrix} 1 & -1 & 0 \\ -1 & 2 & 2 \\ 0 & 2 & 1 \end{bmatrix}$$

(3.4)

```
> l,V:=Eigenvectors(B);
```

$$l, V := \begin{bmatrix} \frac{3}{2} + \frac{1}{2} \sqrt{21} \\ \frac{3}{2} - \frac{1}{2} \sqrt{21} \\ 1 \end{bmatrix}, \left[\left[\begin{matrix} 5 \\ -2 \left(-\frac{1}{2} + \frac{1}{2} \sqrt{21} \right) \left(\frac{1}{2} + \frac{1}{2} \sqrt{21} \right) \end{matrix} \right], \left[\begin{matrix} 5 \\ -2 \left(-\frac{1}{2} - \frac{1}{2} \sqrt{21} \right) \left(\frac{1}{2} - \frac{1}{2} \sqrt{21} \right) \end{matrix} \right], \left[\begin{matrix} 5 \\ 2 \left(-\frac{1}{2} + \frac{1}{2} \sqrt{21} \right) \\ 2 \left(-\frac{1}{2} - \frac{1}{2} \sqrt{21} \right) \end{matrix} \right], \left[\begin{matrix} 1 \\ 1 \\ 1 \end{matrix} \right] \right]$$

(3.5)

```
> Column(V,1).Column(V,2);
```

$$1 + \frac{25}{4 \left(-\frac{1}{2} + \frac{1}{2} \sqrt{21} \right) \left(\frac{1}{2} + \frac{1}{2} \sqrt{21} \right) \left(-\frac{1}{2} - \frac{1}{2} \sqrt{21} \right) \left(\frac{1}{2} - \frac{1}{2} \sqrt{21} \right)} + \frac{25}{4 \left(-\frac{1}{2} + \frac{1}{2} \sqrt{21} \right) \left(-\frac{1}{2} - \frac{1}{2} \sqrt{21} \right)}$$

(3.6)

```
> simplify(Column(V,1).Column(V,2));
```

(3.7)

```

0
> simplify(Column(V,2).Column(V,3));
0
> simplify(Column(V,3).Column(V,1));
0

```

(3.7)

(3.8)

(3.9)

4

```

> f1:=unapply(a*x^2-b*x-a+b,x);
f1 := x → a x2 - b x - a + b

```

(4.1)

```

> b0:=solve(f1(-2)=6,b);
b0 := -a + 2

```

(4.2)

```

> x0:=solve(diff(f1(x),x),x);
x0 := 1/2 * b/a

```

(4.3)

```

> subs(b=b0,x0);
1/2 * (-a + 2)/a

```

(4.4)

```

> factor(subs(b=b0,f1(x0)));
-1/4 * (3a - 2)2/a

```

(4.5)

5

```

> dmax:=0;
for i from 1 to 1000 do
  dt:=evalf(sqrt(ithprime(i+1))-sqrt(ithprime(i)));
  if dt>dmax then
    dmax:=dt;
    print(dmax,ithprime(i),ithprime(i+1));
  end if;
end do;
dmax := 0
0.317837246, 2, 3
0.504017169, 3, 5
0.670873479, 7, 11

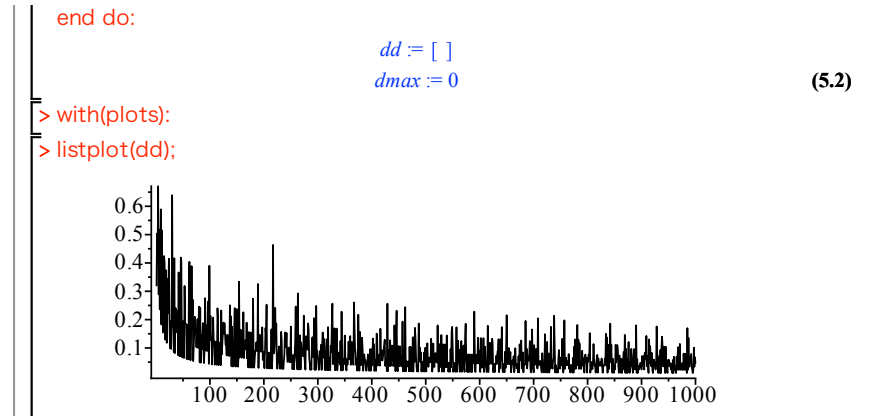
```

(5.1)

```

> dd:=[];
dmax:=0;
for i from 1 to 1000 do
  dt:=evalf(sqrt(ithprime(i+1))-sqrt(ithprime(i)));
  dd:=[op(dd),dt];

```



(5.2)