

1

```
> exp(x^x);
diff(exp(x^x), x);
```

$$e^{x^x}$$

$$x^x (\ln(x) + 1) e^{x^x}$$

(1.1)

```
> x*cos(x);
series(x*cos(x), x, 5);
f:=unapply(convert(%, polynomial), x);
```

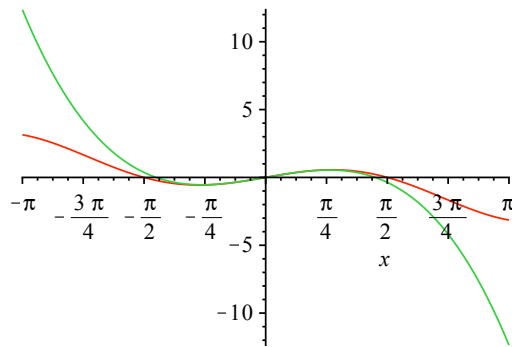
$$x \cos(x)$$

$$x - \frac{1}{2} x^3 + O(x^5)$$

$$f := x \rightarrow x - \frac{1}{2} x^3$$

(1.2)

```
> plot([x*cos(x), f(x)], x=-Pi..Pi);
```



2

```
> int(cos(x)^3/sin(x), x=Pi/6..Pi/2);
```

$$-\frac{3}{8} + \ln(2)$$

(2.1)

```
> int(int(x/(1+y^2), x=0..y), y=0..1);
```

$$\frac{1}{2} - \frac{1}{8} \pi$$

(2.2)

3

```
> with(LinearAlgebra):
A:=Matrix([[1, a, a^3], [1, b, b^3], [1, c, c^3]]);
```

$$A := \begin{bmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{bmatrix}$$

(3.1)

```
> factor(Determinant(A));
-(-c+b)(a-c)(a-b)(a+c+b)
```

(3.2)

```
> A:=Matrix([[2, -1, -2], [-1, 1, 1], [-2, 1, 4]]);
```

$$A := \begin{bmatrix} 2 & -1 & -2 \\ -1 & 1 & 1 \\ -2 & 1 & 4 \end{bmatrix}$$

(3.3)

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

$$l, V := \begin{bmatrix} 3 + \sqrt{7} \\ 3 - \sqrt{7} \\ 1 \end{bmatrix},$$

(3.4)

$$\begin{bmatrix} -\frac{6(5+2\sqrt{7})}{(13+5\sqrt{7})(1+\sqrt{7})} & -\frac{6(5-2\sqrt{7})}{(13-5\sqrt{7})(1-\sqrt{7})} & 1 \\ \frac{2(2+\sqrt{7})}{13+5\sqrt{7}} & \frac{2(2-\sqrt{7})}{13-5\sqrt{7}} & -1 \\ 1 & 1 & 1 \end{bmatrix}$$

```
> v1:=Column(V, 1);
v2:=Column(V, 2);
v3:=Column(V, 3);
```

$$v1 := \begin{bmatrix} -\frac{6(5+2\sqrt{7})}{(13+5\sqrt{7})(1+\sqrt{7})} \\ \frac{2(2+\sqrt{7})}{13+5\sqrt{7}} \\ 1 \end{bmatrix}$$

$$v2 := \begin{bmatrix} -\frac{6(5-2\sqrt{7})}{(13-5\sqrt{7})(1-\sqrt{7})} \\ \frac{2(2-\sqrt{7})}{13-5\sqrt{7}} \\ 1 \end{bmatrix}$$

$$v3 := \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$$

(3.5)

```
> simplify(v1.v3);
simplify(v1.v2);
simplify(v2.v3);
```

$$0$$

$$0$$

$$0$$

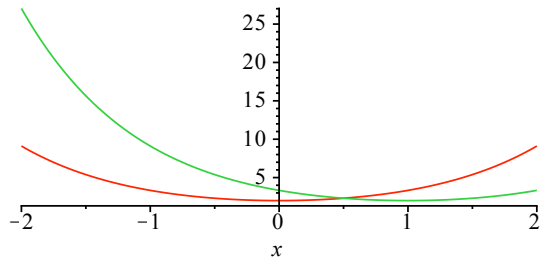
(3.6)

4

```
> restart;
> f:=unapply(3^x+3^(-x),x);
      f:=x→3x+3-x
```

(4.1)

```
> plot([f(x),f(x-1)],x=-2..2);
```



```
> f(x-1);
      3x-1+3-x+1
```

(4.2)

```
> simplify(f(x-1)-(1/3*3^x+3*3^(-x)));
      0
```

(4.3)

```
> solve(f(x)=f(x-1),x);
```

(4.4)

$$\frac{1}{2}$$

```
> f(1/2);
```

$$\frac{4}{3}\sqrt{3}$$

(4.5)

5

```
> restart;
> f:=unapply(3*a*x^2-(8*a+6)*x+4*a+6,x);
      f:=x→3ax2-(8a+6)x+4a+6
```

(5.1)

```
> g:=unapply(3*b*x^2+u*x+v,x);
      g:=x→3bx2+ux+v
```

(5.2)

```
> e1:=int(g(x),x=-1..0)=-6;
```

$$e1 := b - \frac{1}{2}u + v = -6$$

(5.3)

```
> e2:=g(-1)=-9;
```

$$e2 := 3b - u + v = -9$$

(5.4)

```
> s1:=solve({e1,e2},{u,v});
```

$$s1 := \{u = 4b + 6, v = b - 3\}$$

(5.5)

```
> e3:=f(0)=g(0);
```

$$e3 := 6 + 4a = v$$

(5.6)

```
> e4:=subs(x=0,diff(f(x),x))=subs(x=0,diff(g(x),x));
```

$$e4 := -6 - 8a = u$$

(5.7)

```
> subs(s1,{e3,e4});
```

$$\{-6 - 8a = 4b + 6, 6 + 4a = b - 3\}$$

(5.8)

```
> s2:=solve(subs(s1,{e3,e4}},{a,b});
      s2 := {a = -2, b = 1}
```

(5.9)

```
> subs(s2,subs(x=0,diff(f(x),x))*x+f(0));
      10x - 2
```

(5.10)

```
> plot(subs(s2,[f(x),subs(s1,g(x)),10*x-2]),x=-1..2);
```

