```
Remove["Global`*"]
```

```
(* Ergebnisse sind rot unterlegt *)
```

```
(* 1 *)
```

```
(* a *)
```

```
f[x_] := x
```

```
g[x_] := x^3
```

```
Integrate[Abs[f[x] - g[x]], {x, 0, 2}]
```

$$\frac{5}{2}$$

```
(* b *)
```

```
u[t_] = 4 Sin[2 t] + a t
```

$$a\,t + 4\,\text{Sin}[2\,t]$$

```
v[t_] = Integrate[u[t], t] + c
```

$$c + \frac{a\,t^2}{2} - 2\,\text{Cos}[2\,t]$$

```
ls = Solve[v[0] == 1, c]
```

$$\{\{c \to 3\}\}$$

```
ls1 = ls[[1]]
```

$$\{c \to 3\}$$

```
v[t_] = v[t] /. ls1
```

$$3 + \frac{a\,t^2}{2} - 2\,\text{Cos}[2\,t]$$

```
ls = Solve[v[Pi / 2] == 2, a]
```

$$\left\{\left\{a \to -\frac{24}{\pi^2}\right\}\right\}$$

```
% // N
```

$$\{\{a \to -2.43171\}\}$$

```
v[t_] = v[t] /. ls[[1]]
```

$$3 - \frac{12\,t^2}{\pi^2} - 2\,\text{Cos}[2\,t]$$

```
(* 2 *)
Y = {{-2, 3}, {1, 1}};
% // MatrixForm
```

$$\begin{pmatrix} -2 & 3 \\ 1 & 1 \end{pmatrix}$$

```
Z = {{2, -1}, {3, 1}};
% // MatrixForm
```

$$\begin{pmatrix} 2 & -1 \\ 3 & 1 \end{pmatrix}$$

```
(* a *)
Y.Z // MatrixForm
```

$$\begin{pmatrix} 5 & 5 \\ 5 & 0 \end{pmatrix}$$

```
(* b *)
b = {3, -1};
c = Z.b
```

$$\{7, 8\}$$

```
(* c *)
X = Z.Inverse[Y] // MatrixForm
```

$$\begin{pmatrix} -\frac{3}{5} & \frac{4}{5} \\ -\frac{2}{5} & \frac{11}{5} \end{pmatrix}$$

```
(* 3 *)
(* a *)

f[x_] := x^2 - Exp[-x]

Series[f[x], {x, 1 / 2, 1}] // Normal
```

$$\frac{1}{4}-\frac{1}{\sqrt{e}}+\left(1+\frac{1}{\sqrt{e}}\right)\left(-\frac{1}{2}+x\right)$$

```
% // N
```

$$-0.357+1.61\,(x-1/2)$$

```
(* b *)

Series[Cos[x^2], {x, 0, 8}] // Normal
```

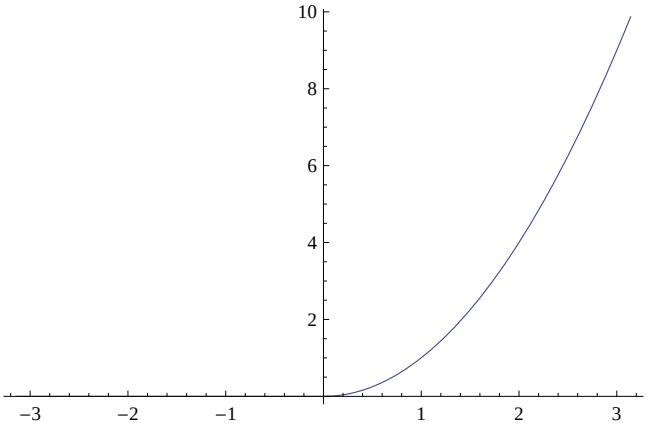
$$1-\frac{x^4}{2}+\frac{x^8}{24}$$

```
(* 4 *)

Clear[f]

f[t_] := t^2 UnitStep[t]

Plot[f[t], {t, -Pi, Pi}]
```




```
(* hier nur EINE Periode *)

<< "FourierSeries`"

p = 2 Pi;

ω = 2 Pi / p
```

1

```
FourierTrigSeries[f[t], t, 3, FourierParameters → {1, ω}]
```

$$\frac{\pi^2}{6} - 2\,\text{Cos}[t] + \frac{1}{2}\,\text{Cos}[2\,t] - \frac{2}{9}\,\text{Cos}[3\,t] + \frac{1}{2}\left(-\frac{8}{\pi} + 2\,\pi\right)\text{Sin}[t] - \frac{1}{2}\,\pi\,\text{Sin}[2\,t] + \frac{1}{2}\left(-\frac{8}{27\,\pi} + \frac{2\,\pi}{3}\right)\text{Sin}[3\,t]$$

```
% // Expand
```

$$\frac{\pi^2}{6} - 2\,\text{Cos}[t] + \frac{1}{2}\,\text{Cos}[2\,t] - \frac{2}{9}\,\text{Cos}[3\,t] - \frac{4\,\text{Sin}[t]}{\pi} + \pi\,\text{Sin}[t] - \frac{1}{2}\,\pi\,\text{Sin}[2\,t] - \frac{4\,\text{Sin}[3\,t]}{27\,\pi} + \frac{1}{3}\,\pi\,\text{Sin}[3\,t]$$

```
gesuchteKomponenten = -2/9 Cos[3 t] + (-4/(27 π) + 1/3 π) Sin[3 t];

(* Amplitude: *)

A3 = Sqrt[(-2/9)^2 + (-4/(27 π) + 1/3 π)^2] // N
```

1.024

```
(* 5 *)
```

```
Clear[f]
```

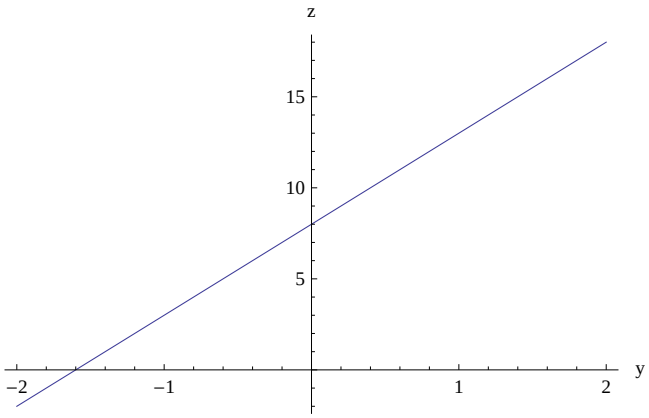
```
f[x_, y_] := x^2 y + 4 x + y
```

```
(* a *)
```

```
z = f[2, y]
```

```
8 + 5 y
```

```
Plot[z, {y, -2, 2}, AxesLabel -> {"y", "z"} ]
```




```
df = D[f[x, y], x] dx + D[f[x, y], y] dy
```

$$dy\left(1+x^2\right)+dx\,(4+2\,x\,y)$$

```
werte = {x → 3, y → -1, dx → -0.2, dy → 0.1};
```

```
df /. werte
```

```
1.4`
```