Lösungen / Statistik 1/08

```
Remove["Global`*"]

<< Statistics`DescriptiveStatistics`;
<< Statistics`DataManipulation`;
<< Graphics`Graphics`;
```

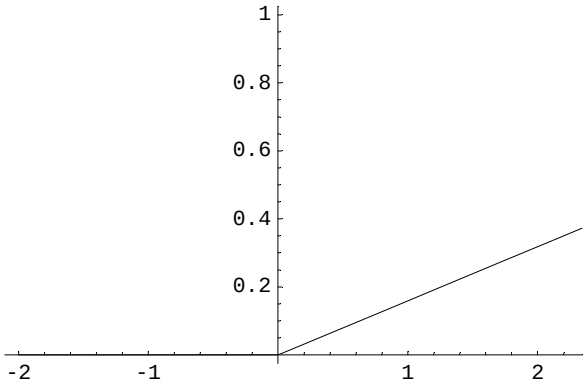
1.

a P(X<=x):=di(x)

```
d1[x_] := 0; d2[x_] := x / (2 Pi); d3[x_] := 1;
```

b

```
F[x_] := d1[x] /; x < 0;
F[x_] := d2[x] /; 0 <= x < 2 Pi;
F[x_] := d3[x] /; 2 Pi ≤ x;
Plot[F[x], {x, -2, 8}];
```

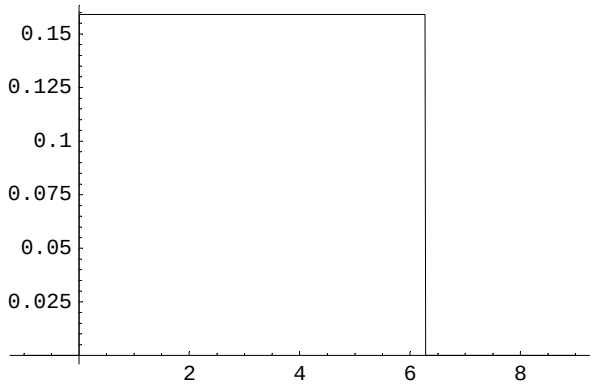


c f(x)= F'(x)

```
f[x_] := (Evaluate[D[d1[t], t]] /. t → x) /; x < 0;
f[x_] := (Evaluate[D[d2[t], t]] /. t → x) /; 0 <= x < 2 Pi;
f[x_] := (Evaluate[D[d3[t], t]] /. t → x) /; 2 Pi ≤ x; {f[-1], f[2], f[8]}
```

$\left\{0, \frac{1}{2\pi}, 0\right\}$

```
Plot[f[x], {x, -1, 9}];
```



2.

a

```
Remove[f]
```

```
Integrate[k * x, {x, 0, 2}]
```

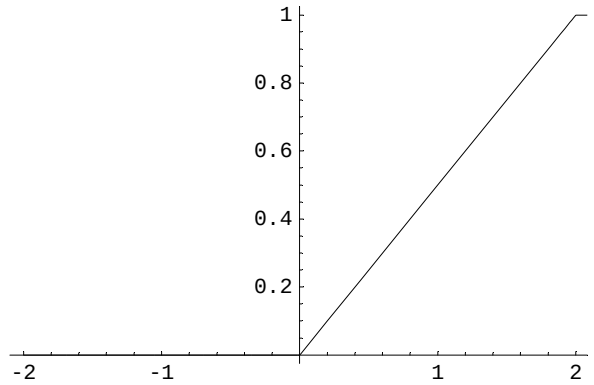
2 k

```
s = Solve[Integrate[k * x, {x, 0, 2}] == 1, {k}] // Flatten
```

$\left\{k \to \frac{1}{2}\right\}$

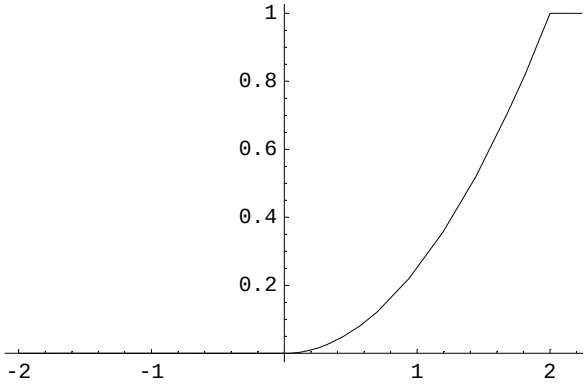
b

```
f[x_] := 0 /; x < 0;
f[x_] := x / 2 /; 0 <= x < 2;
f[x_] := 1 /; 2 ≤ x;
Plot[f[x], {x, -2, 4}];
```



c

```
Remove[F]

F[x_] := 0 /; x < 0;
F[x_] := Integrate[t / 2, {t, 0, x}] /; 0 <= x < 2;
F[x_] := 1 /; 2 ≤ x;
Plot[F[x], {x, -2, 4}];
```



3.

a

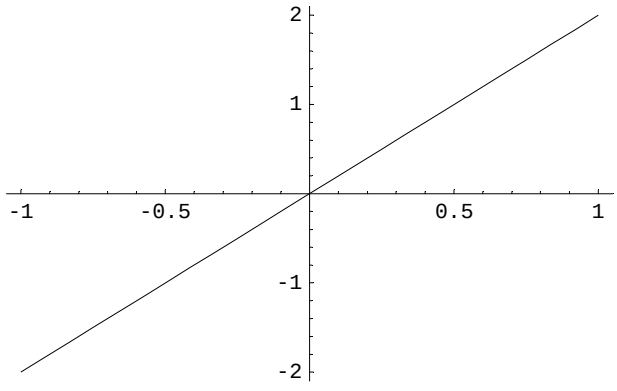
```
Remove[f, F, k, x]

Integrate[k * x, {x, -1, 1}]
```

```
0
```

```
k1 = 2; k1 * x
```

```
2 x
```

```
Plot[k1 * x, {x, -1, 1}];
```




```
Solve[Integrate[k * x, {x, -1, 1}] == 1, {k}]
```

```
{}
```

Integral=1 nicht erfüllbar / Integral=1 ne pas possible

4.

a

```
Remove[f, F, k, x]
```

```
f1[x_] := 0;
f2[x_] := c E^(-a x);
Integrate[f2[x], {x, 0, Infinity}]
```

$$c\ \text{If}\left[\text{Re}[a] > 0,\ \frac{1}{a},\ \text{Integrate}[e^{-a\,x},\ \{x,\ 0,\ \infty\},\ \text{Assumptions} \to \text{Re}[a] \le 0]\right]$$

```
f2[x_] := Re[c] E^(-Re[a] x);
Integrate[f2[x], {x, 0, Infinity}]
```

$$\text{If}\left[\text{Re}[a] > 0,\ \frac{1}{\text{Re}[a]},\ \text{Integrate}[e^{-x\,\text{Re}[a]},\ \{x,\ 0,\ \infty\},\ \text{Assumptions} \to \text{Re}[a] \le 0]\right] \text{Re}[c]$$

```
Integrate[f2[x], {x, 0, b}] // Expand
```

$$\frac{\text{Re}[c]}{\text{Re}[a]} - \frac{e^{-b\,\text{Re}[a]}\,\text{Re}[c]}{\text{Re}[a]}$$

```
a1 = (Expand[Integrate[f2[x], {x, 0, b}]] /. {b Re[a] → Infinity})
```

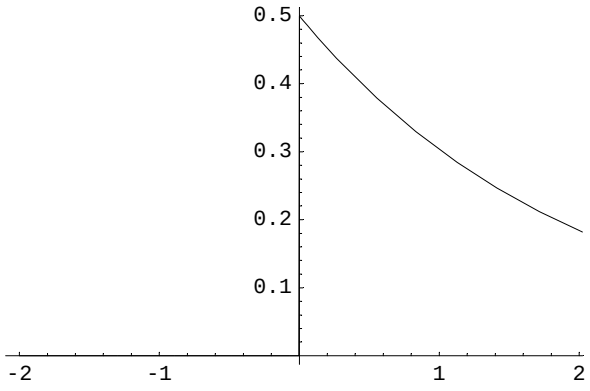
$$\frac{\text{Re}[c]}{\text{Re}[a]}$$

```
Solve[c / a == 1, {c}]
```

$$\{\{c \to a\}\}$$

```
a0 = 1 / 2;
f21[x_] := a0 E^(-a0 x);
```

```
f[x_] := f1[x] /; x < 0;
f[x_] := f21[x] /; x >= 0;
Plot[f[x], {x, -2, 5}];
```



```
Integrate[f21[x], {x, 0, Infinity}]
```

```
1
```

```
F[x_] := f1[x] /; x < 0;
F[x_] := Evaluate[Integrate[f21[t], {t, 0, x}]] /; x >= 0;
Plot[F[x], {x, -2, 10}];
```