Lösungen Uebungen 3 Anal. M+E

Mit etwas Programmiercode (in Mathematica)

Uebung 1

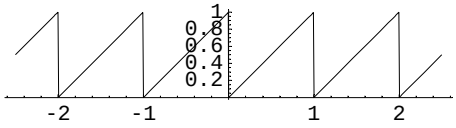
Individuell

Uebung 2

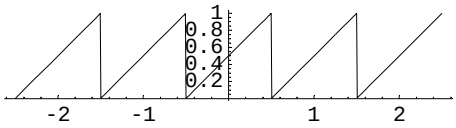
---

a

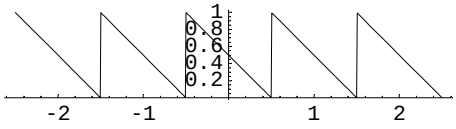
```
f[1, x_] := x - Floor[x];
p[1] = Plot[f[1, x], {x, -2.5, 2.5}, AspectRatio → 1 / 5];
```



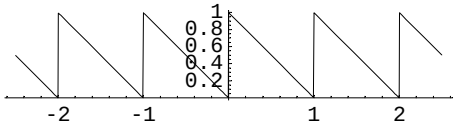

```
f[2, x_] := f[1, x - 0.5];
p[2] = Plot[f[2, x], {x, -2.5, 2.5}, AspectRatio → 1 / 5];
```



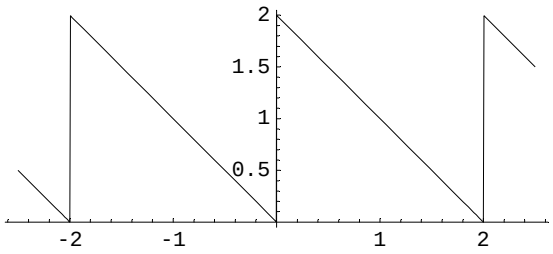

```
f[3, x_] := f[2, -x];
p[3] = Plot[f[3, x], {x, -2.5, 2.5}, AspectRatio → 1 / 5];
```



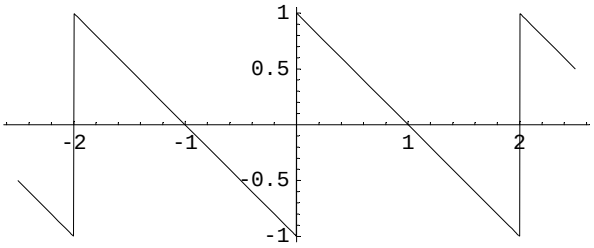

```
f[4, x_] := f[3, x + 0.5];
p[4] = Plot[f[4, x], {x, -2.5, 2.5}, AspectRatio → 1 / 5];
```



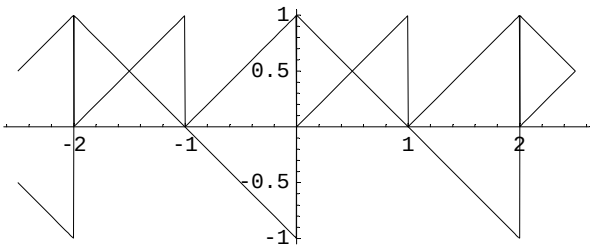
```
f[5, x_] := 2 f[4, 1 / 2 x];
p[5] = Plot[f[5, x], {x, -2.5, 2.5}, AspectRatio → 2 / 5];
```



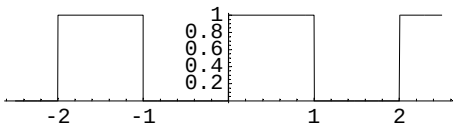

```
f[6, x_] := f[5, x] - 1;
p[6] = Plot[f[6, x], {x, -2.5, 2.5}, AspectRatio → 2 / 5];
```



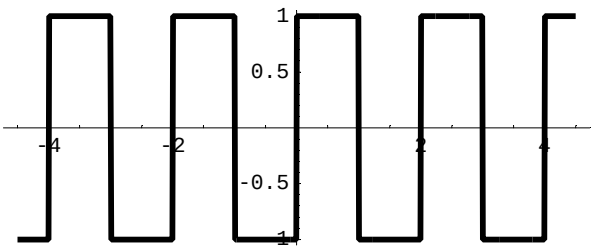

```
Show[p[6], p[1]];
```




```
f[7, x_] := f[1, x] + f[6, x]; p[7] = Plot[f[7, x], {x, -2.5, 2.5}, AspectRatio → 1 / 5];
```

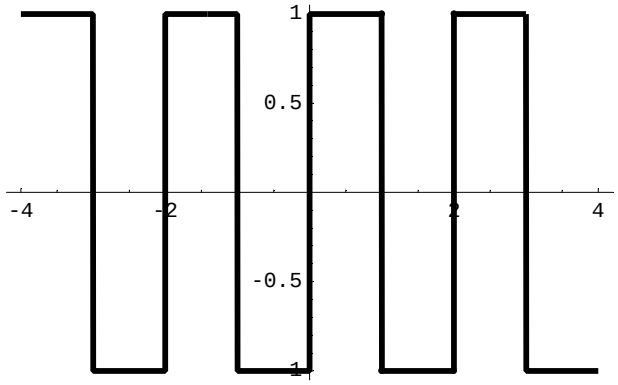



```
f[8, x_] := 2 f[7, x] - 1;
p[8] =
  Plot[f[8, x], {x, -4.5, 4.5}, PlotStyle → Thickness[0.01], AspectRatio → 2 / 5 ];
```



b

```
Plot[Sign[Sin[x Pi]], {x, -4, 4}, PlotStyle → Thickness[0.01], PlotPoints → 100];
```



Uebung 3

```
f[x_] := Cos[x]; g[x_] := ArcCos[x]; h[x_] := E^x;
```

a

```
gof[x_] := g[f[x]]; gof[x]
```

```
ArcCos[Cos[x]]
```

b

```
fog[x_] := f[g[x]]; fog[x]
```

```
x
```

```
hog[x_] := h[g[x]]; hog[x]
```

$e^{\text{ArcCos}[x]}$

c

```
hoogof[x_] := h[gof[x]]; hogoof[x]
```

```
hogoof[x]
```

d

```
hogoof[x_] := hog[f[x]]; hogoof[x]
```

$e^{\text{ArcCos[Cos[x]]}}$

```
hogoof[x] == hogoof[x]
```

True

Uebung 4

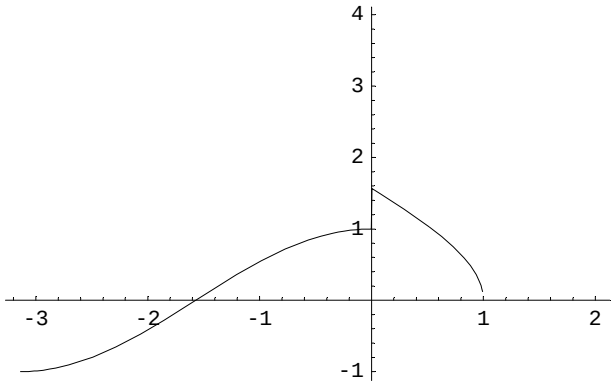
```
Remove[u]
```

Beachte die Definition der Funktion! / Considérer la définition de la fonction!

```
u[t_] := Cos[t]     /; (t ≤ 0); u[t_] := ArcCos[t] /; (0 < t && t < Pi / 2);
u[t_] := E^t /; (+Pi / 2 <= t);
```

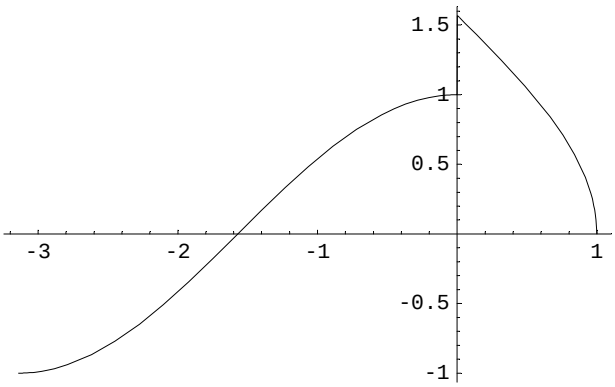
Lücke in D(f)! / Lacune (espace) dans D(f)!

```
Plot[u[x], {x, -Pi, 2}];
```

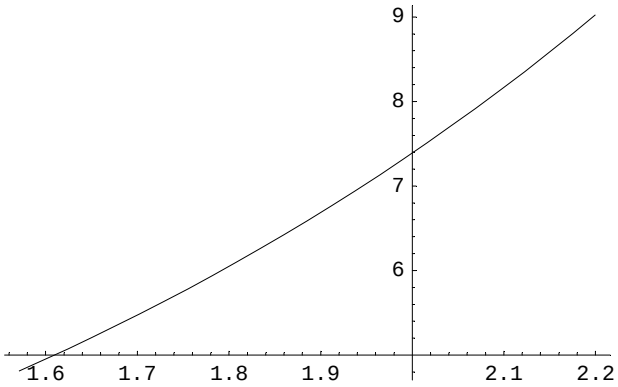


Lücke in D(f)! / Lacune (espace) dans D(f)!

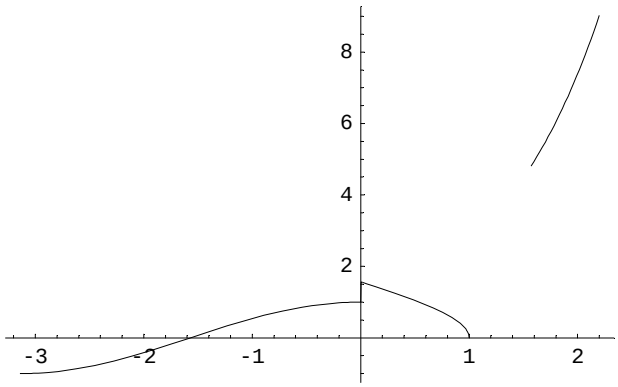
```
p1 = Plot[u[x], {x, -Pi, 1}];
```



```
p2 = Plot[u[x], {x, Pi / 2, 2.2}];
```




```
Show[p1, p2];
```



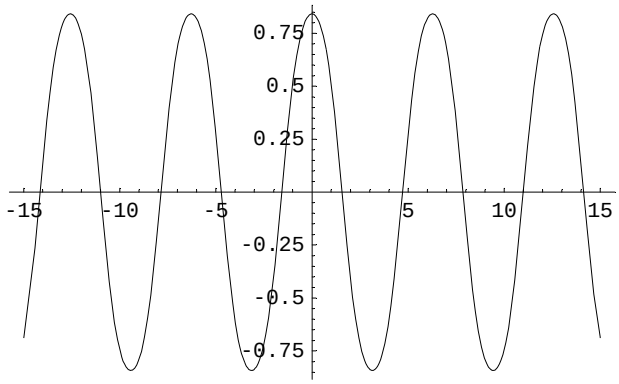
Uebung 5

---

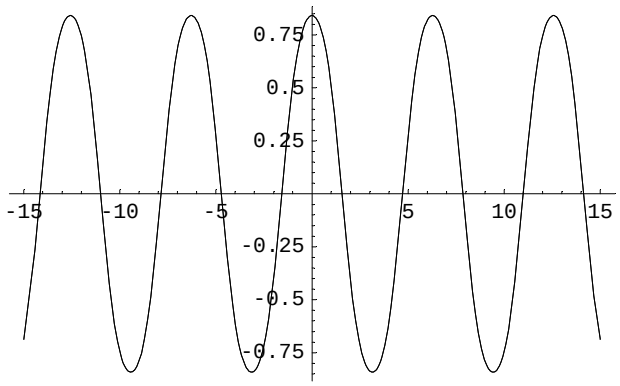
a

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

Plot[f[x], {x, -15, 15}];
```

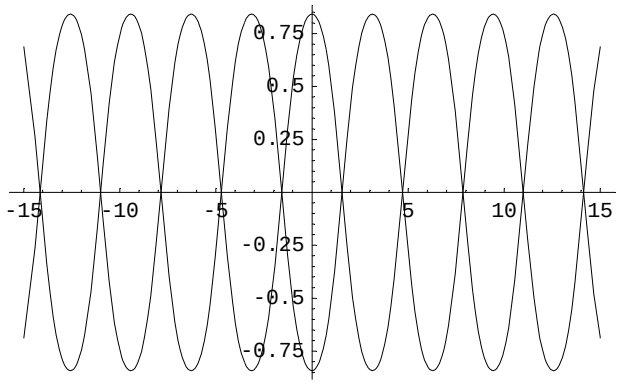


```
Plot[{f[x], f[-x]}, {x, -15, 15}];
```



f gerade, monoton zwischen 0 und Pi und den Wiederholungen dieses Intervalls, keine Pole

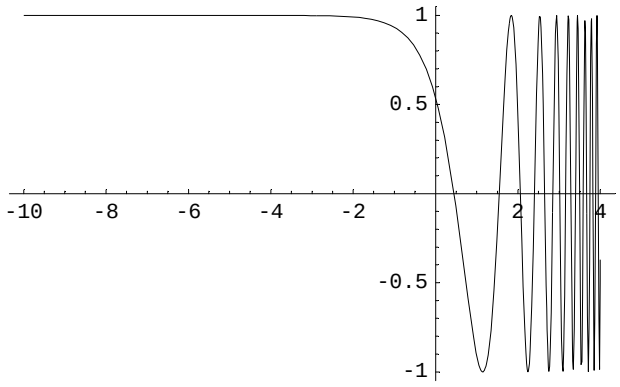
```
Plot[{f[x], -f[-x]}, {x, -15, 15}];
```



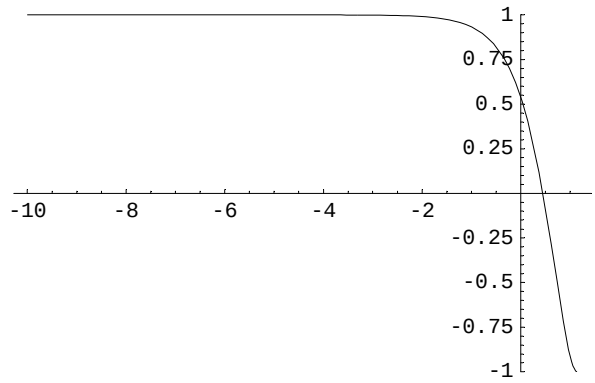
b

```
f[x_] := Cos[E^x]
```

```
Plot[f[x], {x, -10, 4}];
```

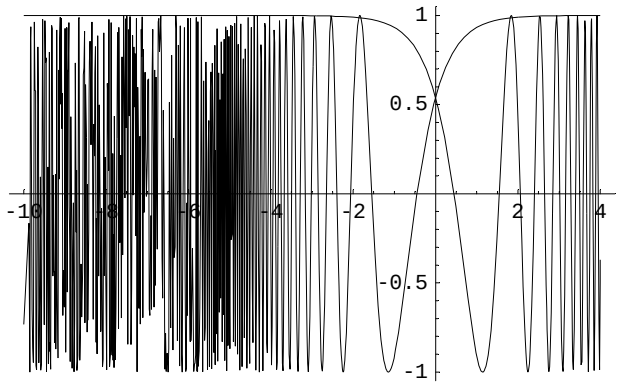


```
Plot[f[x],{x,-10,Log[Pi]},PlotRange->{-1,1}];
```



Weder gerade noch ungerade, Monotonie ablesbar (z.B. zwischen minus unendlich und ln(Pi), dann zwischen ln(Pi) u.s.w.), keine Pole

```
Plot[{f[x], f[-x]}, {x, -10, 4}];
```

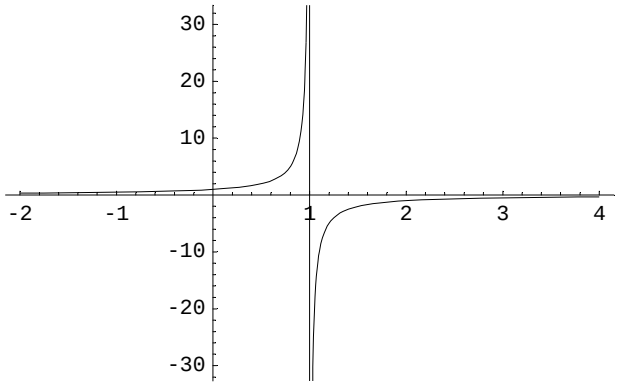


C

```
Remove[f];

f[x_] := (2 - x) / (x^2 - 3 x + 2)

Plot[f[x], {x, -2, 4}];
```



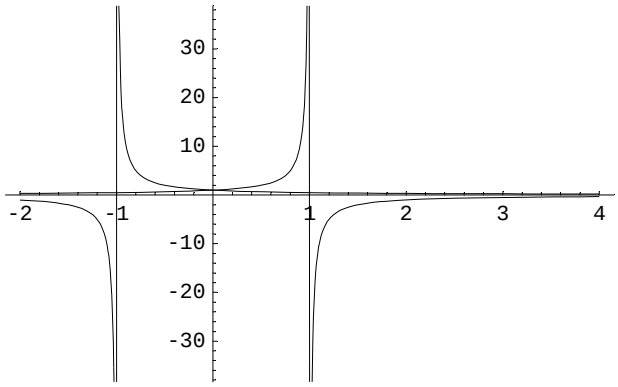
Weder gerade noch ungerade

```
Solve[x^2-3x+2==0,{x}]
```

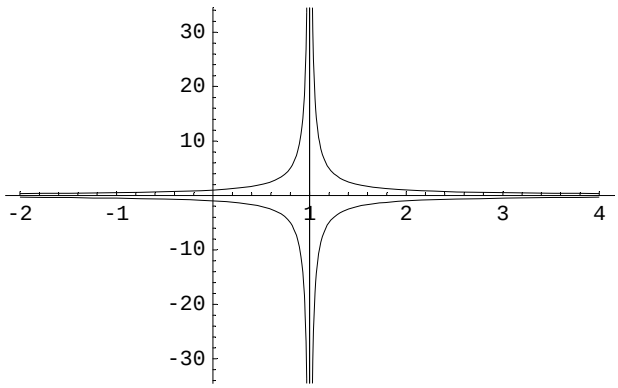
```
{{x → 1}, {x → 2}}
```

Nicht definiert in x=1 (Pol) und in x=2 (stetig fortsetzbar).

```
Plot[{f[x], f[-x]}, {x, -2, 4}];
```




```
Plot[{f[x], f[-(x - 1) + 1]}, {x, -2, 4}];
```




```
Plot[{f[x], f[-(-(x - 1)) + 1]}, {x, -2, 4}];
```