Lösungen / Statistik 2/03
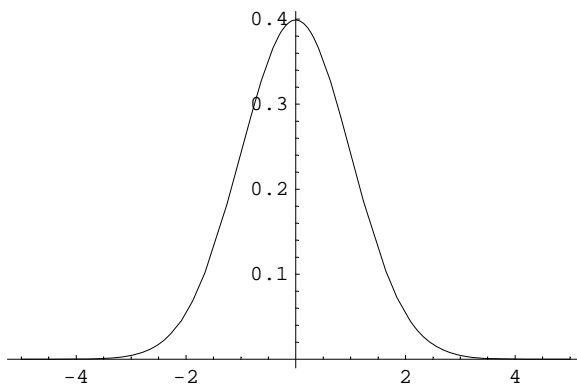
```
Remove["Global`*"]
```

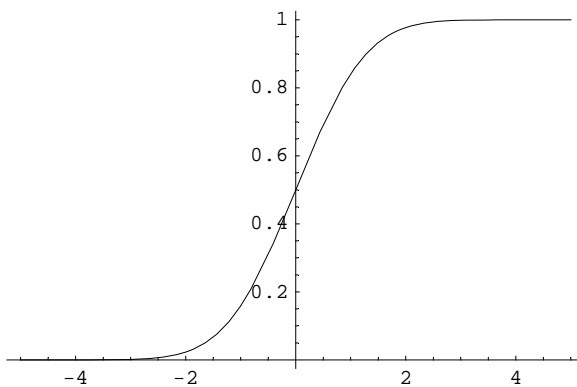---

1.

```
f[v_, μ_, σ_] := 1 / (σ Sqrt[2 Pi]) E ^ (-1 / 2 * (v - μ) ^ 2 / σ ^ 2);
F[x_, μ_, σ_] := Evaluate[Integrate[f[v, μ, σ], {v, -Infinity, x}]]
```
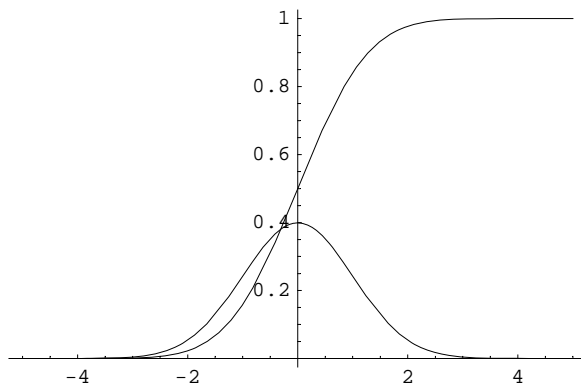
■ a

```
Plot[f[v, 0, 1], {v, -5, 5}];
```



```
Plot[F[x, 0, 1], {x, -5, 5}];
```
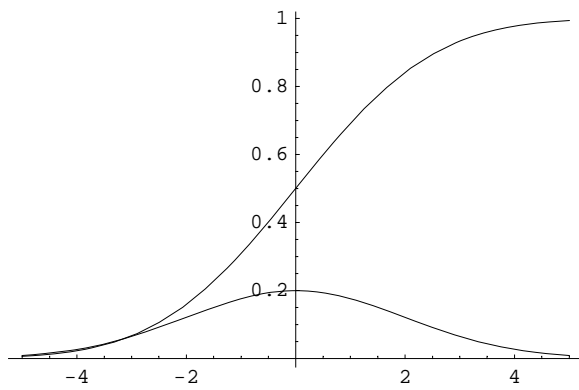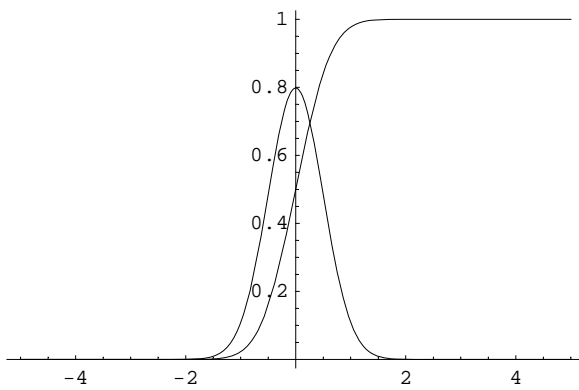
```
Plot[{f[x, 0, 1], F[x, 0, 1]}, {x, -5, 5}];
```

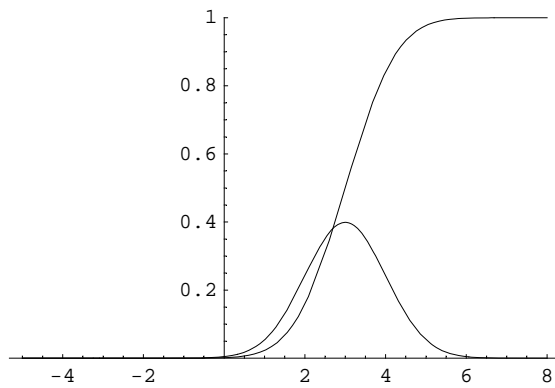■ **b**

```
Plot[{f[x, 0, 2], F[x, 0, 2]}, {x, -5, 5}];
```

■ **c**

```
Plot[{f[x, 0, 1 / 2], F[x, 0, 1 / 2]}, {x, -5, 5}];
```
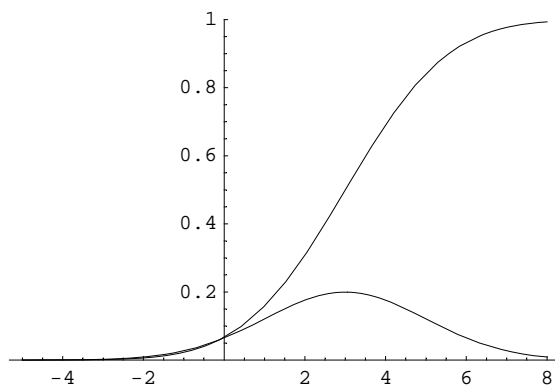
▪ **d**

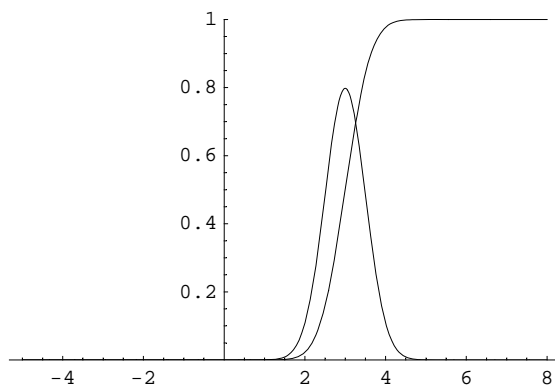Plot[{f[x, 3, 1], F[x, 3, 1]}, {x, -5, 8}, PlotRange → {0, 1}];

▪ **d**

Plot[{f[x, 3, 2], F[x, 3, 2]}, {x, -5, 8}, PlotRange → {0, 1}];

▪ **e**
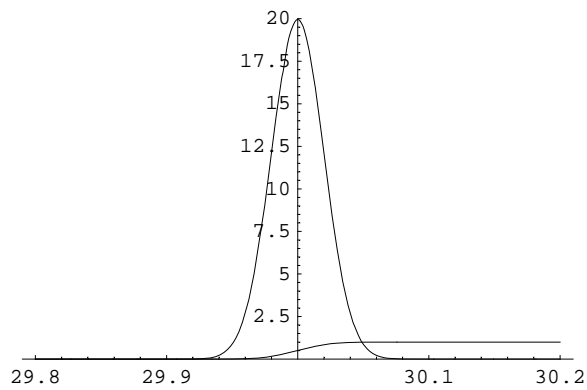
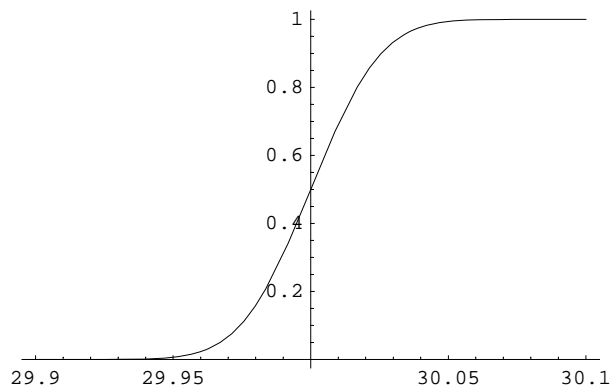Plot[{f[x, 3, 1/2], F[x, 3, 1/2]}, {x, -5, 8}, PlotRange → {0, 1}];

2.

```
Plot[{f[x, 30, 0.02], F[x, 30, 0.02]}, {x, 29.8, 30.2}, PlotRange → {0, 20}];
```



```
Plot[{F[x, 30, 0.02]}, {x, 29.9, 30.1}];
```


Ausschuss / Rebut (%) :

```
((1 - F[30 + 0.03, 30, 0.02]) + F[30 - 0.03, 30, 0.02])
```

```
0.133614
```

```
((1 - F[30 + 0.03, 30, 0.02]) + F[30 - 0.03, 30, 0.02]) *100 // N
```

```
13.3614
```

3.

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

▪ a

```
n = 400; p = 0.07; m = 10;
```

```
<< Statistics`DiscreteDistributions`
```

```
bdist[n_] := BinomialDistribution[n, p]
```

```
pdf[n_, x_] := PDF[bdist[n], x];
cdf[n_, m_] := CDF[bdist[n], m];

1 - cdf[n, m - 1]

0.999982

Sum[pdf[n, x], {x, m, n}]

0.999982
```

▪ b

```
f[v_, μ_, σ_] := 1 / (σ Sqrt[2 Pi]) E ^ (-1 / 2 * (v - μ) ^ 2 / σ^2);
F[x_, μ_, σ_] := Evaluate[Integrate[f[v, μ, σ], {v, -Infinity, x}]]

q = 1 - p; μ = n * p; σ = Sqrt[μ * q];

1 - F[10, μ, σ] // N

0.99979

1 - F[9, μ, σ] // N

0.999902

1 - F[9.5, μ, σ] // N

0.999856
```

4.

```
Remove["Global`*"]

points =
  {{0, 0.497}, {1, 0.580}, {2, 0.839}, {3, 0.933}, {4, 1.044}, {5, 1.141}, {6, 1.151},
   {7, 1.313}, {8, 1.404}, {9, 1.409}, {10, 1.422}, {11, 1.451}, {12, 1.529}};
```
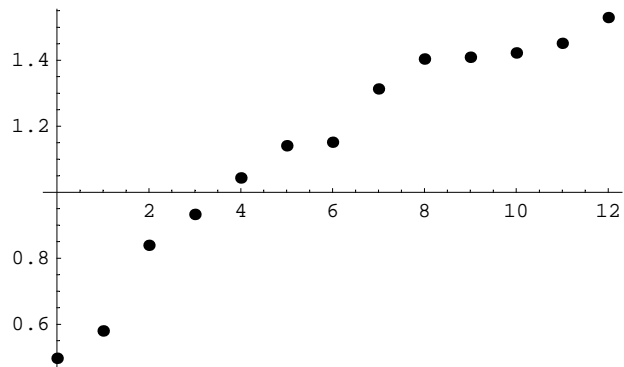
▪ a

```
f1 = FindFit[points, a + b x, {a, b}, x]

{a → 0.630703, b → 0.083511}

fg1[x_] := a + b x /. f1;  fg1[x]

0.630703 + 0.083511 x
```
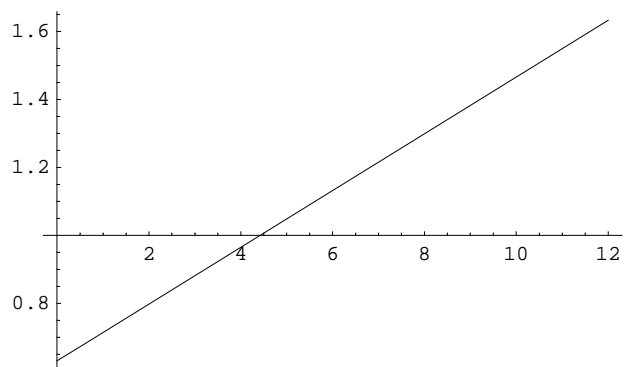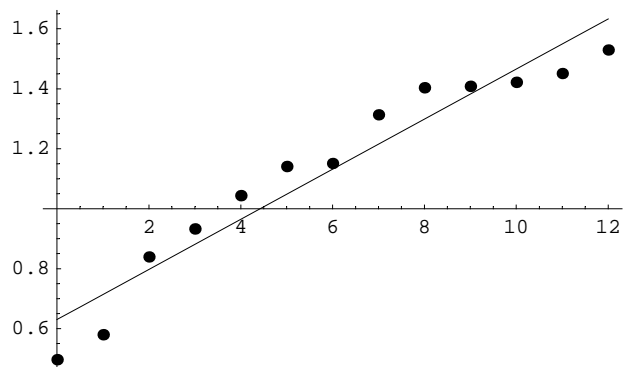
plotpoints = ListPlot[points, PlotStyle → PointSize[0.02]];

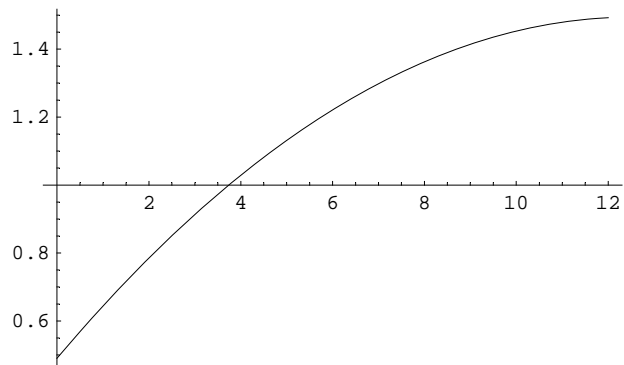**pl1 = Plot[fg1[x], {x, 0, 12}];**

Show[pl1, plotpoints];

■ **b**

f2 = FindFit[points, a + b x + c x^2, {a, b, c}, x]
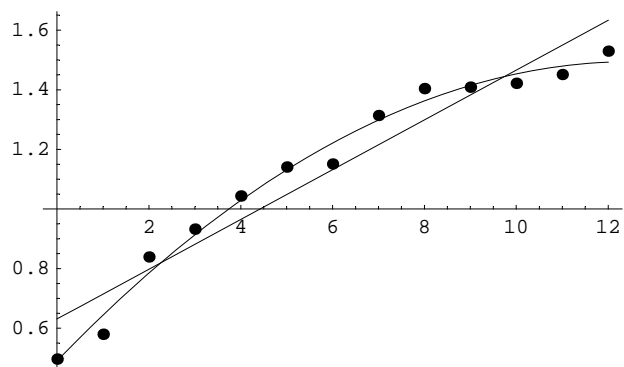
$\{a \to 0.490363, b \to 0.16006, c \to -0.00637912\}$

fg2[x_] := a + b x + c x^2 /. f2;   fg2[x]

$0.490363 + 0.16006 x - 0.00637912 x^2$

```
pl2 = Plot[fg2[x], {x, 0, 12}];
```



```
Show[pl1, pl2, plotpoints];
```
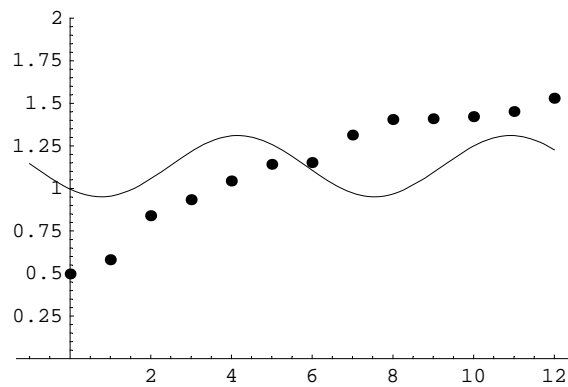

■ C

```
sin = a + b Sin[c + d x];
```

```
f3 = FindFit[points, sin, {a, b, c, d}, x];
sin /. f3
```

$1.13073 - 0.179832 \, \text{Sin}[0.84797 + 0.929293 \, x]$

```
Plot[sin /. f3, {x, -1, 12}, AxesOrigin → {0, 0}, PlotRange → {Automatic, {0, 2}},
  Epilog → Prepend[Point /@ points, PointSize[0.02]]];
```

■ **d**

```
trigpoly = c + d Cos[x]² + e Cos[x]² + f Cos[x]³ + g Sin[x] + h Sin[x]² + i Sin[x]³;
```
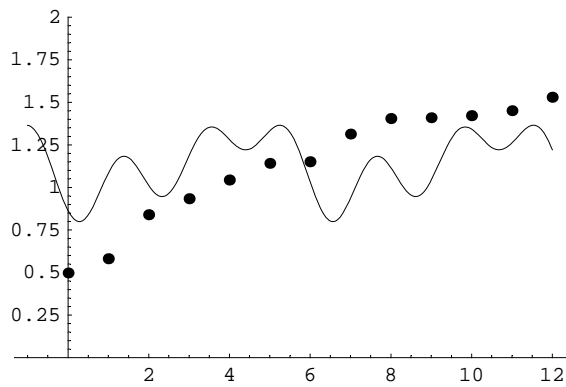
```
f4 = FindFit[points, trigpoly, {c, d, e, f, g, h, i}, x]
```

$\{c \to 0.487792, d \to 0.231707, e \to 0.572626,$
$f \to -0.427833, g \to -0.448662, h \to 0.722827, i \to 0.398751\}$

```
trigpoly /. f4
```

$0.487792 + 0.231707 \, Cos[x] + 0.572626 \, Cos[x]^2 -$
$0.427833 \, Cos[x]^3 - 0.448662 \, Sin[x] + 0.722827 \, Sin[x]^2 + 0.398751 \, Sin[x]^3$

```
Plot[trigpoly /. f4, {x, -1, 12}, AxesOrigin → {0, 0},
  PlotRange → {Automatic, {0, 2}}, Epilog → Prepend[Point /@ points, PointSize[0.02]]];
```


■ **e**

```
? *Fit*
```

System`

FindFit Fit FitAll