Lösungen / Statistik 2/10

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

1.

```
Table[Binomial[4, m], {m, 0, 4}]
```

```
{1, 4, 6, 4, 1}
```

```
hyp[nN_, n_, mM_, m_] := Binomial[mM, m] Binomial[nN - mM, n - m] / Binomial[nN, n]
```

```
poi[nN_, n_, mM_, m_] := Binomial[n, m] (mM / nN)^m (1 - (mM / nN))^(n - m)
```

```
quot[nN_, n_, mM_, m_] := hyp[nN, n, mM, m] / poi[nN, n, mM, m]
```

```
Table[hyp[1000, 10, 5, m], {m, 0, 10}] // N
```

```
{0.950894, 0.0482198, 0.000879388, 7.12055×10^-6,
 2.51991×10^-8, 3.05444×10^-11, 0., 0., 0., 0., 0.}
```

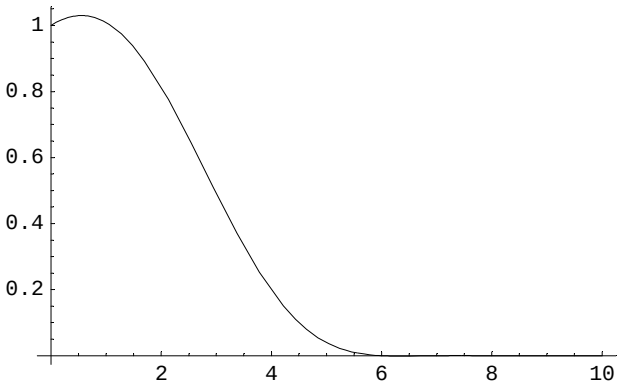
```
Table[poi[1000, 10, 5, m], {m, 0, 10}] // N
```

```
{0.95111, 0.0477945, 0.00108078, 0.0000144828, 1.27361×10^-7, 7.68008×10^-10,
 3.21612×10^-12, 9.23508×10^-15, 1.74028×10^-17, 1.94336×10^-20, 9.76563×10^-24}
```

```
Table[quot[1000, 10, 5, m], {m, 0, 10}] // N
```

```
{0.999772, 1.0089, 0.813661, 0.491655, 0.197855, 0.0397709, 0., 0., 0., 0., 0.}
```

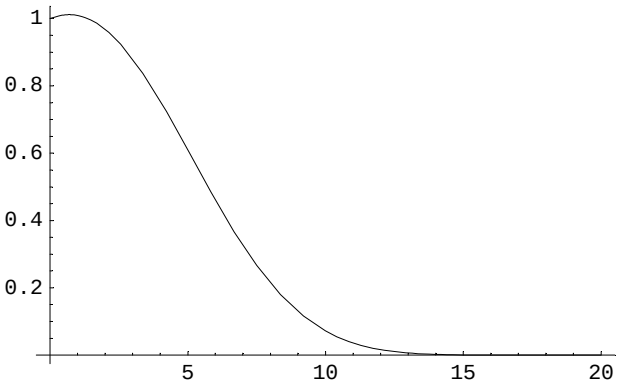
```
Plot[quot[1000, 10, 5, m], {m, 0, 10}];
```




```
Table[quot[10000, 100, 20, m], {m, 0, 20}] // N
```

```
{0.999002, 1.00901, 0.968067, 0.879811, 0.755103, 0.609888, 0.461765, 0.326276,
 0.214053, 0.129613, 0.0719361, 0.0362917, 0.0164766, 0.00664858, 0.00234723,
 0.000710218, 0.000179062, 0.0000361127, 5.46177×10^-6, 5.50647×10^-7, 2.77548×10^-8}
```

```
Plot[quot[10000, 100, 20, m], {m, 0, 20}];
```



2.

a

1

```
lHyp[nN_, n_, p_, c_] :=
 Sum[Binomial[p nN, m] Binomial[nN (1 - p), n - m] / Binomial[nN, n], {m, 0, c}]
```

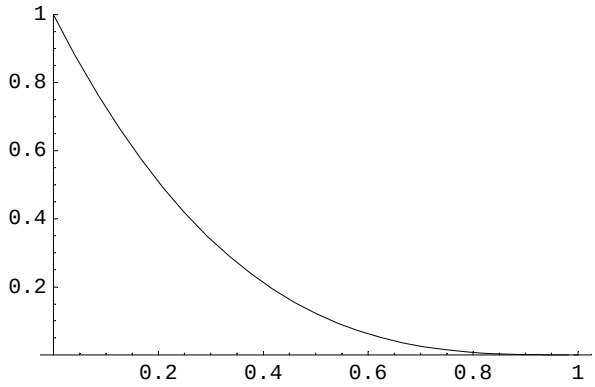
```
Table[lHyp[120, 3, p, 2], {p, 0, 1, 0.1}]
```

```
Power::infy : Infinite expression 1/0. encountered. Mehr…
```

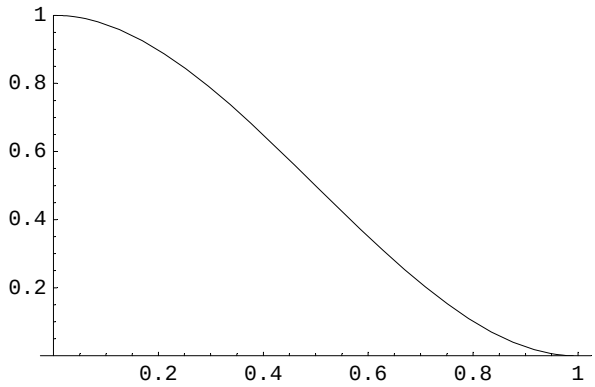
```
Power::infy : Infinite expression 1/0. encountered. Mehr…
```

```
{1, 0.999217, 0.992793, 0.974576, 0.938413,
 0.878151, 0.787637, 0.660718, 0.491241, 0.273052, 0}
```

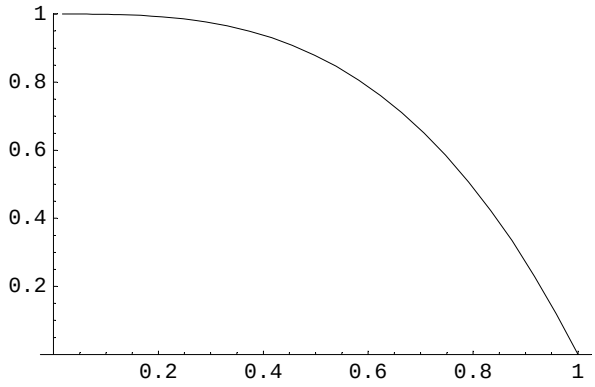
```
Plot[lHyp[120, 3, p, 0], {p, 0, 1}, PlotRange → {0, 1}];
```



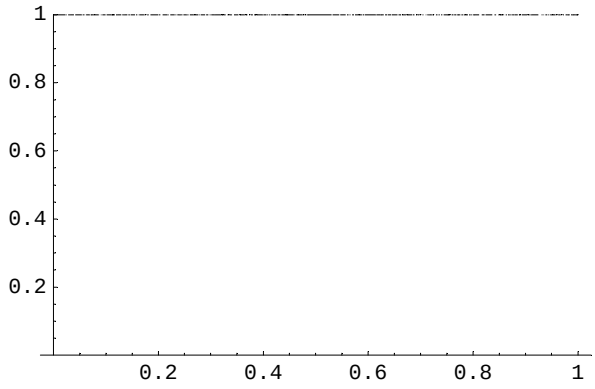
```
Plot[lHyp[120, 3, p, 1], {p, 0, 1}, PlotRange → {0, 1}];
```




```
Plot[lHyp[120, 3, p, 2], {p, 0, 1}, PlotRange → {0, 1}];
```




```
Plot[lHyp[120, 3, p, 3], {p, 0, 1}, PlotRange → {0, 1}];
```



2

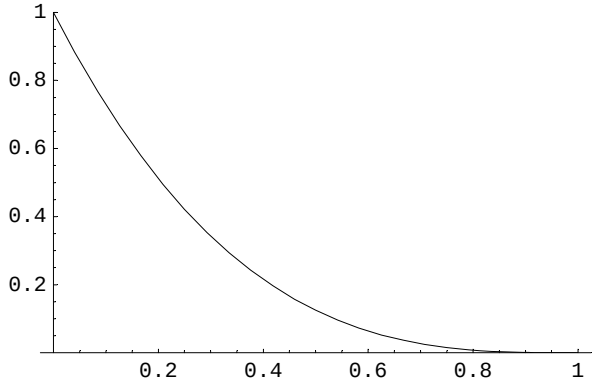
```
lPoi[n_, p_, c_] := Sum[Binomial[n, m] p^m (1 - p)^(n - m), {m, 0, c}]

Table[lPoi[3, p, 2], {p, 0, 1, 0.1}]
```

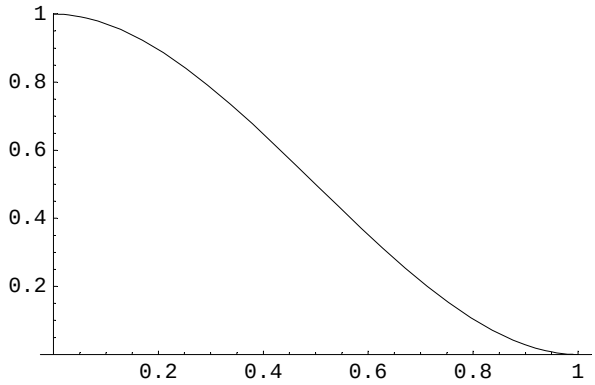
```
Power::indet : Indeterminate expression 0^0 encountered. Mehr…

{Indeterminate, 0.999, 0.992, 0.973, 0.936, 0.875, 0.784, 0.657, 0.488, 0.271, 0.}
```

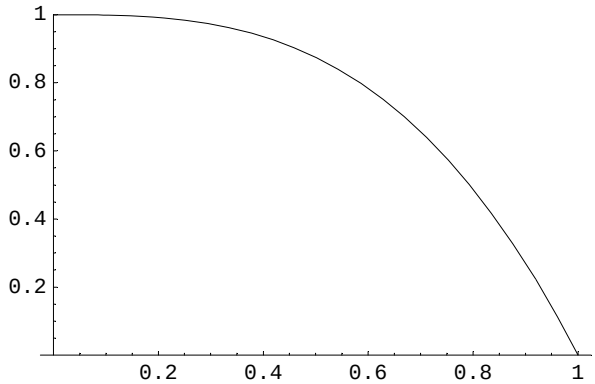
```
Plot[lPoi[3, p, 0], {p, 0, 1}, PlotRange → {0, 1}];
```



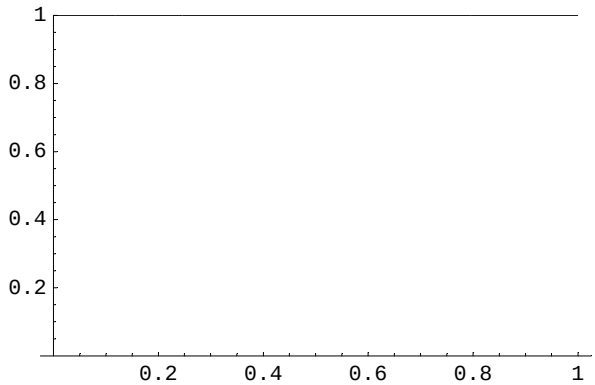

```
Plot[lPoi[3, p, 1], {p, 0, 1}, PlotRange → {0, 1}];
```




```
Plot[lPoi[3, p, 2], {p, 0, 1}, PlotRange → {0, 1}];
```



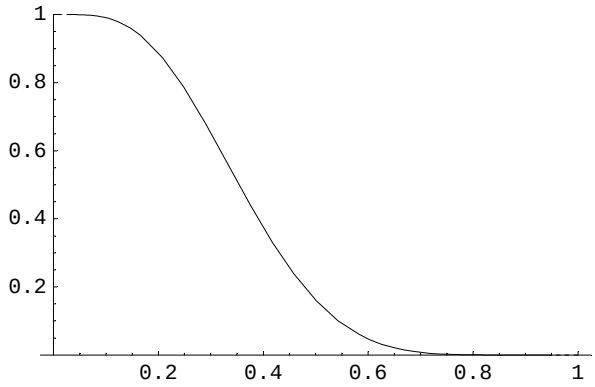

```
Plot[lPoi[3, p, 3], {p, 0, 1}, PlotRange → {0, 1}];
```



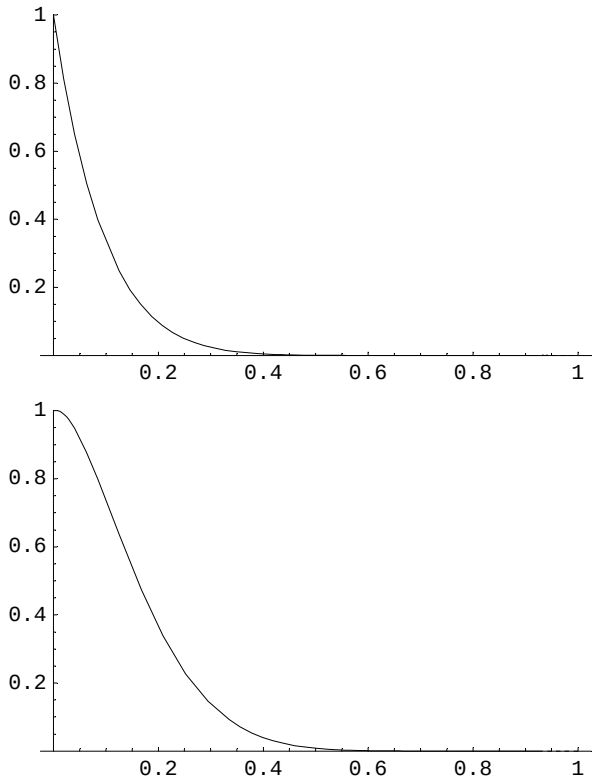
b

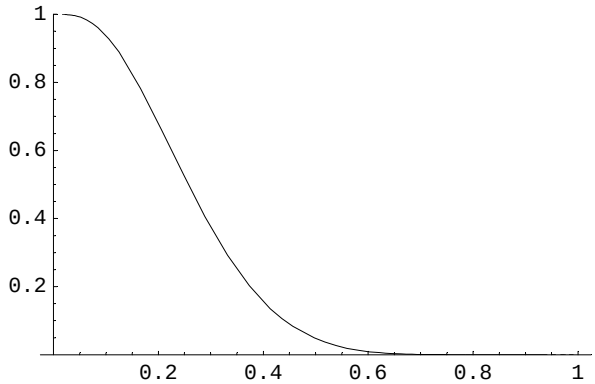
1

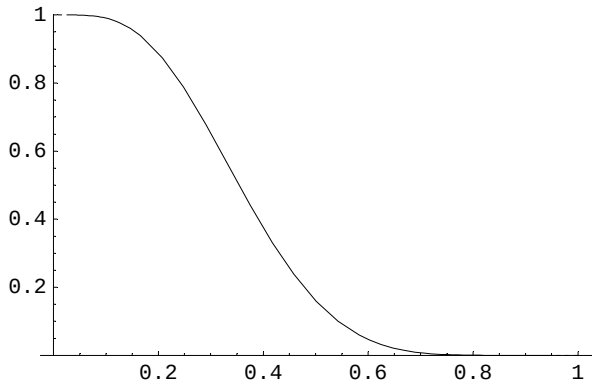
```
Plot[lHyp[120, 10, p, 3], {p, 0, 1}, PlotRange → {0, 1}];
```

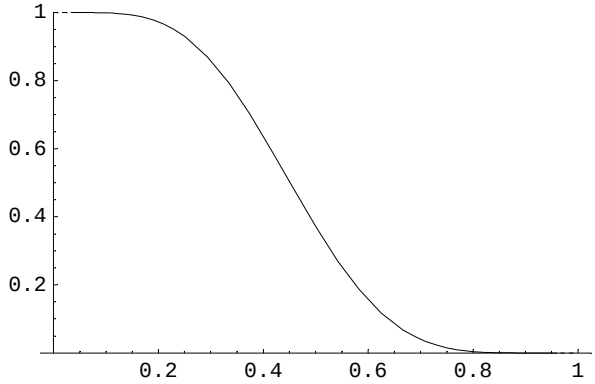


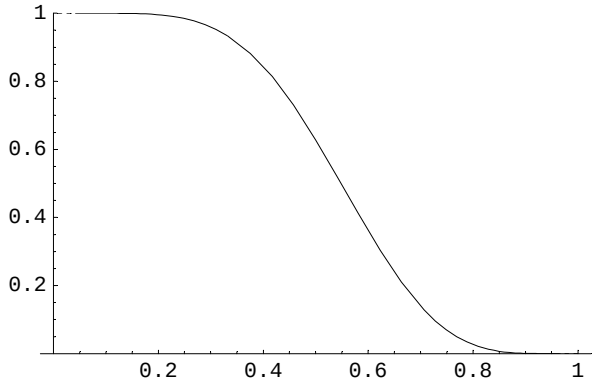

```
GraphicsArray[
  Table[Plot[lHyp[120, 10, p, k], {p, 0, 1}, PlotRange → {0, 1}], {k, 0, 10}]];
```

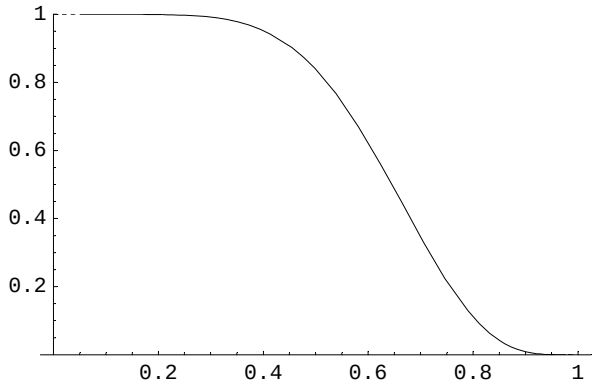


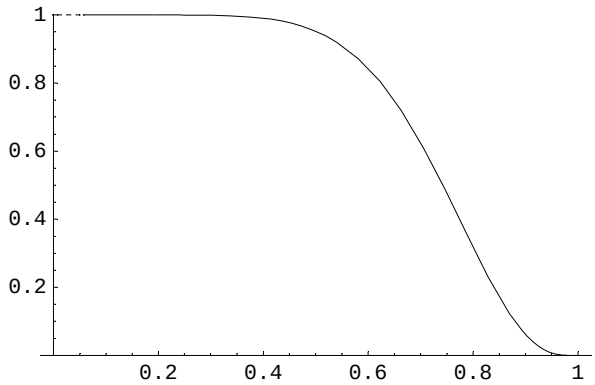

1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1

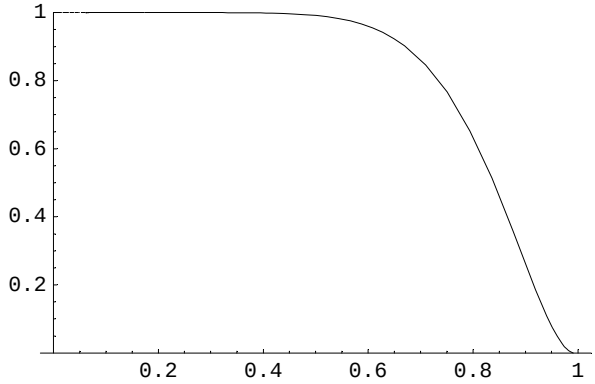

1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1

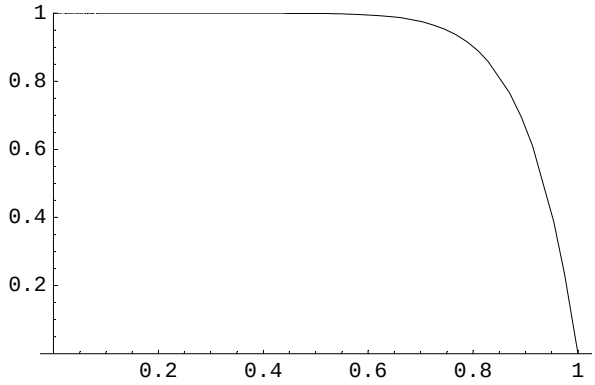

1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1

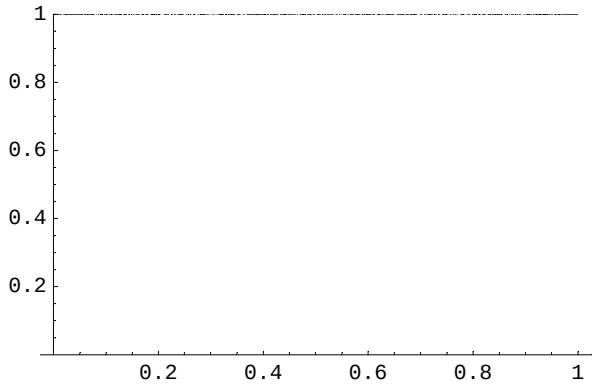

1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1


1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1


1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1


1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1

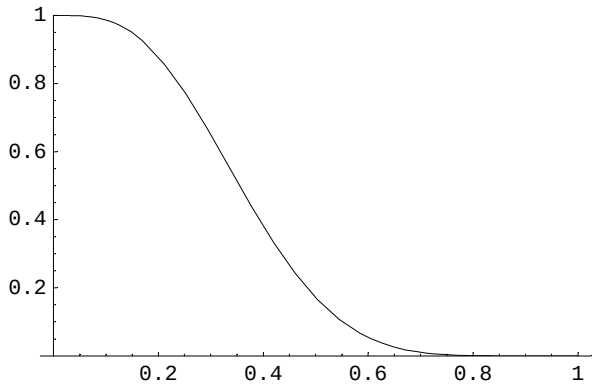

1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1



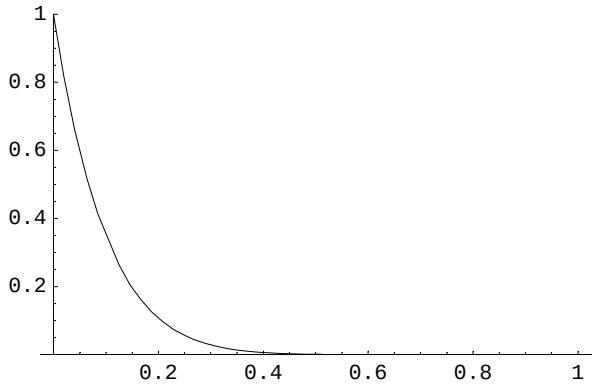
Select the graphics. Then go to "Cell, Animate selected graphics"

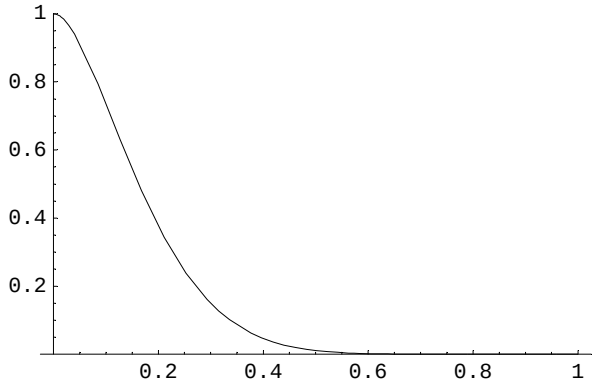
2

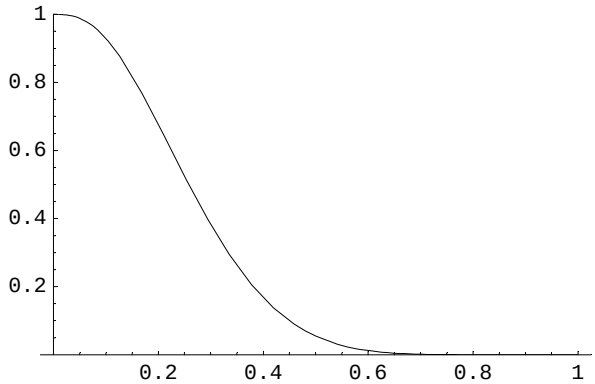
```
Plot[lPoi[10, p, 3], {p, 0, 1}, PlotRange → {0, 1}];
```

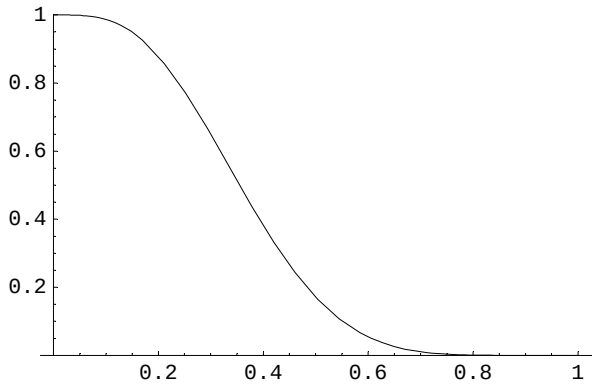


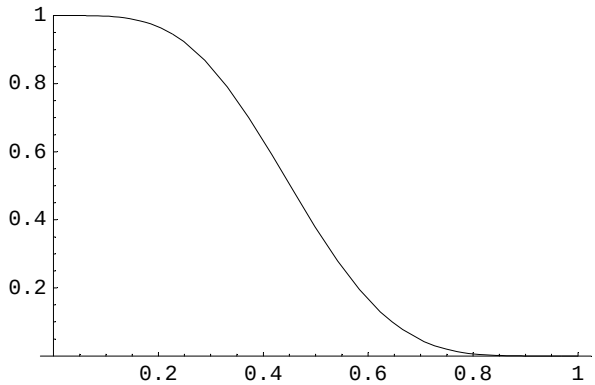

```
GraphicsArray[Table[Plot[lPoi[10, p, k], {p, 0, 1}, PlotRange → {0, 1}], {k, 0, 10}]];
```

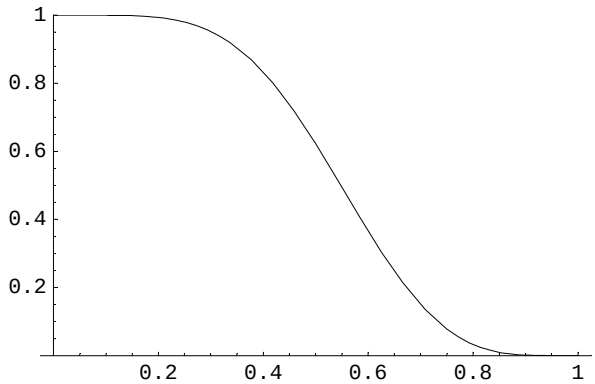


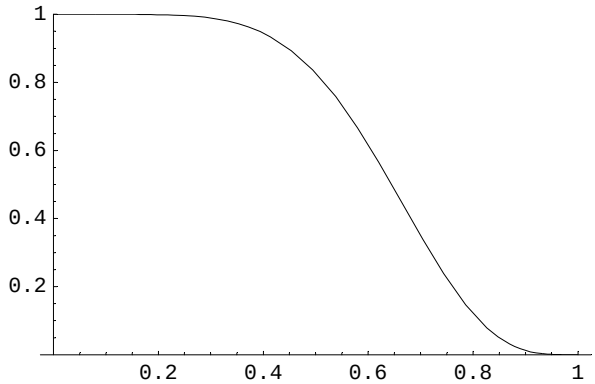


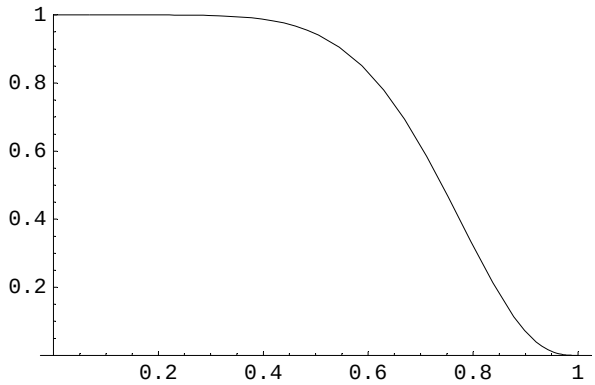

1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1

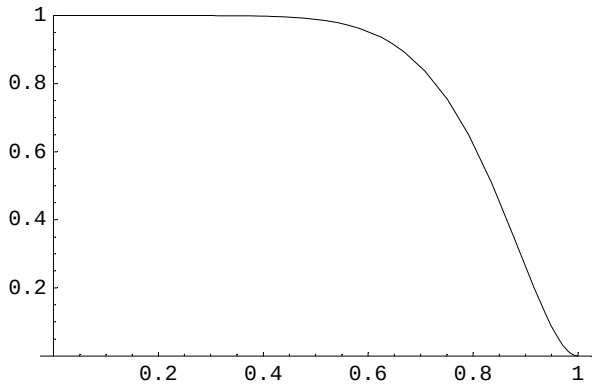

1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1

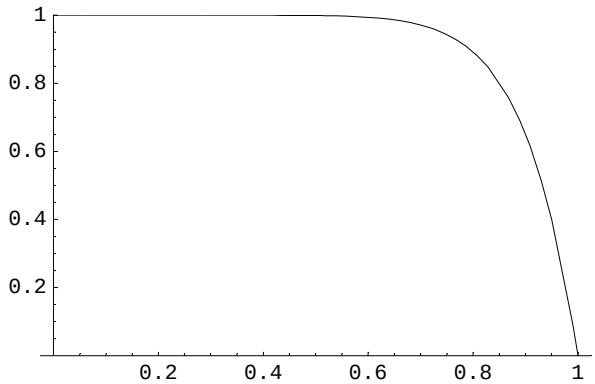

1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1

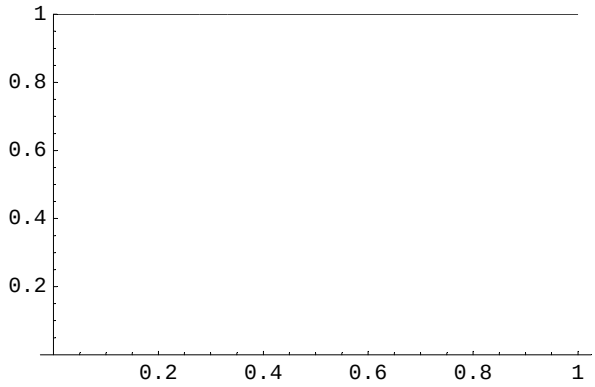

1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1


1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1


1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1


1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1


1
0.8
0.6
0.4
0.2
0.2
0.4
0.6
0.8
1



Select the graphics. Then go to "Cell, Animate selected graphics"