Exercícios
Cap. 3 — Notas apoio 0607

```
<< Graphics`Legend`
```

Exercício 3.8

$$\frac{500}{-\text{Log}[0.95]}$$

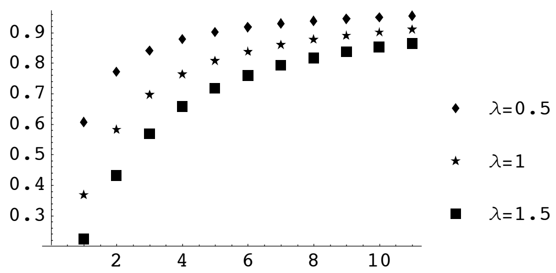
```
9747.86
```

```
<< Statistics`ContinuousDistributions`
<< Statistics`DiscreteDistributions`
<< Graphics`MultipleListPlot`
```

Exercício 3.16 — Poisson

```
f[x_, λ_] := PDF[PoissonDistribution[λ], x];
R[x_, λ_] := 1 - CDF[PoissonDistribution[λ], x];
λ[x_, λ_] = f[x, λ] / R[x - 1, λ];

list1 = Table[N[λ[x, 0.5], 5], {x, 0, 10, 1}]
list2 = Table[N[λ[x, 1], 5], {x, 0, 10, 1}]
list3 = Table[N[λ[x, 1.5], 5], {x, 0, 10, 1}]
MultipleListPlot[{list1, list2, list3}, PlotLegend → {"λ=0.5", "λ=1", "λ=1.5"},
 LegendPosition → {1, -.5}, LegendShadow → None]
```

```
{0.606531, 0.770747, 0.840498, 0.878255, 0.901739,
 0.917701, 0.929235, 0.937951, 0.944764, 0.950235, 0.954723}

{0.36788, 0.58198, 0.69611, 0.76354, 0.80726,
 0.83765, 0.85991, 0.87687, 0.89022, 0.90097, 0.90983}

{0.22313, 0.430825, 0.567698, 0.656598, 0.717013,
 0.760121, 0.792191, 0.816882, 0.83643, 0.852267, 0.865344}
```

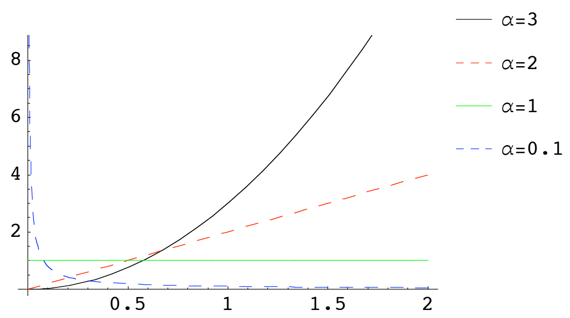



```
- Graphics -
```

■ Exercício 3.16 — Weibull (λ=1,α=0.1,1,2,3)

```
f[x_, α_] = PDF[WeibullDistribution[α, 1], x];
R[x_, α_] = 1 - CDF[WeibullDistribution[α, 1], x];
λ[x_, α_] = f[x, α] / R[x, α]
Plot[{λ[x, 3], λ[x, 2], λ[x, 1], λ[x, .1]},
 {x, 0, 2}, PlotLegend → {"α=3", "α=2", "α=1", "α=0.1"},
 PlotStyle → {GrayLevel[0], {RGBColor[1, 0, 0], Dashing[{.03}]},
   RGBColor[0, 1, 0], {RGBColor[0, 0, 1], Dashing[{.03}]}},
 LegendPosition → {1, -.0}, LegendShadow → None]
```

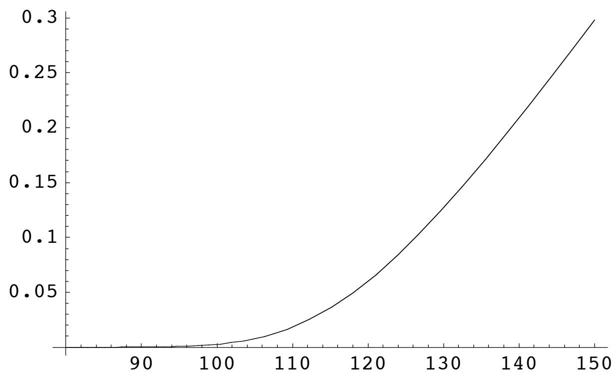
$x^{-1+\alpha}\,\alpha$



- Graphics -

■ Exercício 3.17

```
f[x_] = PDF[NormalDistribution[123.263, 10], x];
R[x_] = 1 - CDF[NormalDistribution[123.263, 10], x];
λ[x_] = f[x] / R[x];
Plot[{λ[x]}, {x, 80, 150}]
```



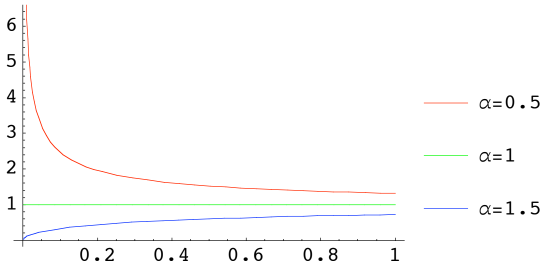
- Graphics -

■ Exercício 3.18

```
<< Statistics`ContinuousDistributions`
```

```
f[x_, α_] = PDF[GammaDistribution[α, 1], x];
R[x_, α_] = 1 - CDF[GammaDistribution[α, 1], x];
λ[x_, α_] = If[α == 1, 1, f[x, α]/R[x, α]];
```

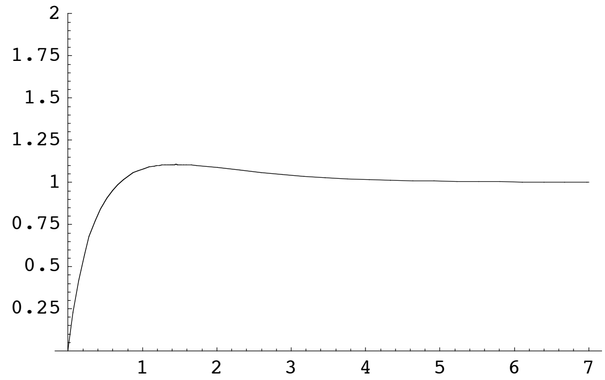
```
Plot[{λ[x, 0.5], λ[x, 1], λ[x, 1.5]},
 {x, 0.001, 1}, PlotLegend → {"α=0.5", "α=1", "α=1.5"},
 PlotStyle → {RGBColor[1, 0, 0], RGBColor[0, 1, 0], RGBColor[0, 0, 1]},
 LegendPosition → {1, -.5}, LegendShadow → None]
```



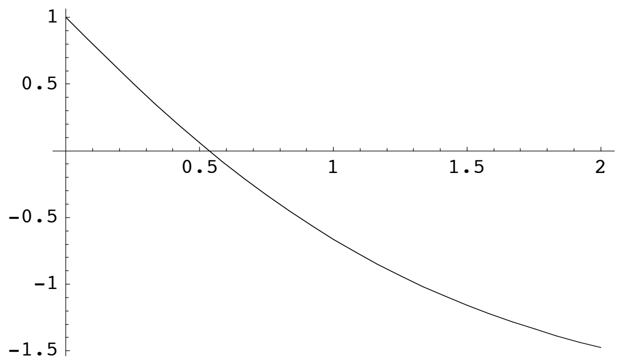
- Graphics -

■ Exercício 3.24

```
λ[t_] = (2 Exp[-2 t] + Exp[-t] - 3 Exp[-3 t]) / (Exp[-2 t] + Exp[-t] - Exp[-3 t]);
Plot[λ[t], {t, 0, 7}, PlotRange → {0, 2}]

f[t_] = -2 + 4 * Exp[-t] - Exp[-2 t];
f[0]
N[f[1]]
Plot[f[t], {t, 0, 2}]
```



```
- Graphics -

1

-0.663818
```



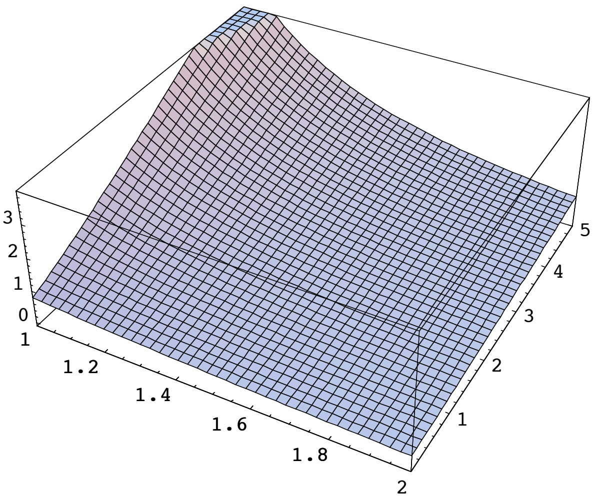
```
- Graphics -
```

■ Exercício 3.37/38 a)2.

```
<< Statistics`ContinuousDistributions`
```

$$\lambda[t\_,\ \mu\_,\ \sigma\_] = \frac{\dfrac{\text{PDF}\left[\text{NormalDistribution}[\mu,\sigma],\ \frac{t-\mu}{\sigma}\right]}{\text{1-CDF}\left[\text{NormalDistribution}[\mu,\sigma],\ \frac{-\mu}{\sigma}\right]}}{\dfrac{\text{1-CDF}\left[\text{NormalDistribution}[\mu,\sigma],\ \frac{t-\mu}{\sigma}\right]}{\text{1-CDF}\left[\text{NormalDistribution}[\mu,\sigma],\ \frac{-\mu}{\sigma}\right]}};$$

```
Plot3D[λ[t, 0, σ], {σ, 1, 2}, {t, 0.00001, 5}, PlotPoints → 40]
```

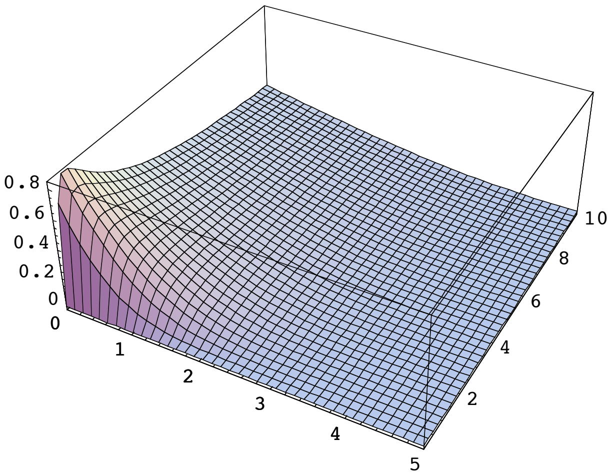


- SurfaceGraphics -

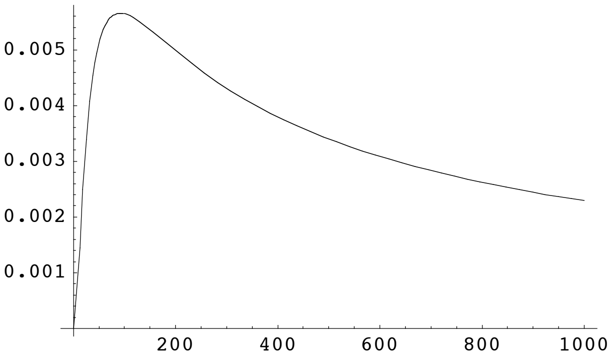
▪ Exercício 3.37/38 a)3.

```
<< Statistics`ContinuousDistributions`
```

```
ψ[t_, μ_] = PDF[LogNormalDistribution[μ, 1], t] / (1 - CDF[LogNormalDistribution[μ, 1], t]);
Plot3D[ψ[t, μ], {μ, 0, 5}, {t, 0.00001, 10}, PlotPoints → 40]
Plot[ψ[t, 5], {t, 0.00001, 1000}, PlotPoints → 40]
```



- SurfaceGraphics -



- Graphics -

■ Exercício 3.37/38 b)

```
ξ[t_, μ_, σ_] = PDF[LogNormalDistribution[μ, σ], t] / (1 - CDF[LogNormalDistribution[μ, σ], t]);
Limit[ξ[t, μ, σ], t → ∞]
Limit[(1 + (Log[t] - μ)/σ) / t, t → ∞]
```

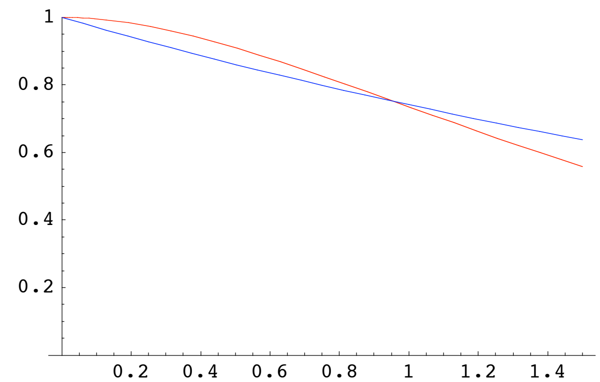
$$\text{Limit}\left[\frac{e^{-\frac{(-\mu+\text{Log}[t])^2}{2\sigma^2}}}{\sqrt{2\pi}\, t\, \sigma \left(1+\frac{1}{2}\left(-1-\text{Erf}\left[\frac{-\mu+\text{Log}[t]}{\sqrt{2}\,\sigma}\right]\right)\right)},\ t \to \infty\right]$$

0

■ Exercício 3.41 - DHR(A)

```
<< Statistics`ContinuousDistributions`

p = 0.25;
q = Quantile[GammaDistribution[2, 1], p]
λ = -(1/q) Log[1 - p]
Plot[{1 - CDF[GammaDistribution[2, 1], t], Exp[-λ t]}, {t, 0, 1.5},
 PlotStyle → {RGBColor[1, 0, 0], RGBColor[0, 0, 1]}, PlotRange → {0, 1}]
```

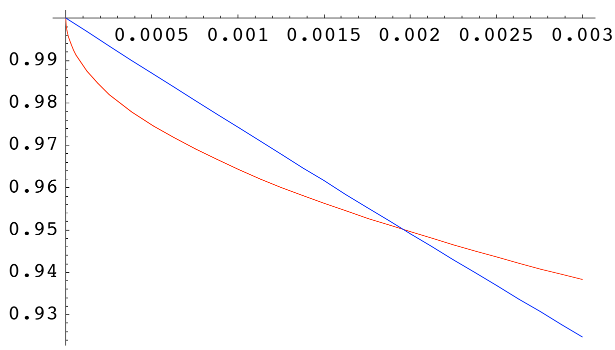
```
0.961279

0.29927
```



- Graphics -

```
p = 0.05;
q = Quantile[GammaDistribution[0.5, 1], p]
λ = -(1/q) Log[1 - p]
Plot[{1 - CDF[GammaDistribution[0.5, 1], t], Exp[-λ t]},
 {t, 0, 0.003}, PlotStyle → {RGBColor[1, 0, 0], RGBColor[0, 0, 1]}]
```

```
0.00196607

26.0893
```



- Graphics -

Exemplo 3.44

```
t = 1.;
While[(t = t + 0.5) ≤ 2,
 h = FindRoot[1 - w - Exp[-w t] == 0, {w, 1}];
 raiz = {w} /. Dispatch[h];
 Print[{t, raiz[[1]], Exp[-raiz[[1]] t]}]
]
```

```
{1.5, 0.582812, 0.417188}

{2., 0.796812, 0.203188}
```

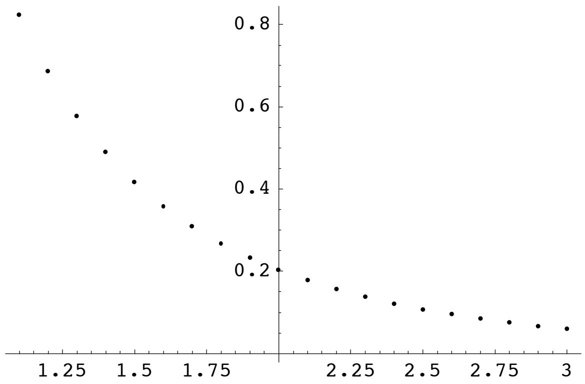
Exemplo 3.48 — limites inferiores f.fiabilidade

```
μ1 = 1;
MatrixForm[Table[{t, If[t < μ1, Exp[-t / μ1], 0]}, {t, 0, 3.0, 0.1}]]

a = {};
t = 1;
inc = 0.1;
While[(t = t + inc) ≤ 3,
 h = FindRoot[1 - w - Exp[-w t] == 0, {w, 1}];
 raiz = {w} /. Dispatch[h];
 a = Append[a, {t, raiz[[1]], Exp[-raiz[[1]] t]}]
]
MatrixForm[a]
```

0	1
0.1	0.904837
0.2	0.818731
0.3	0.740818
0.4	0.67032
0.5	0.606531
0.6	0.548812
0.7	0.496585
0.8	0.449329
0.9	0.40657
1.	0
1.1	0
1.2	0
1.3	0
1.4	0
1.5	0
1.6	0
1.7	0
1.8	0
1.9	0
2.	0
2.1	0
2.2	0
2.3	0
2.4	0
2.5	0
2.6	0
2.7	0
2.8	0
2.9	0
3.	0

1.1	0.176134	0.823866
1.2	0.313698	0.686302
1.3	0.42297	0.57703
1.4	0.511011	0.488989
1.5	0.582812	0.417188
1.6	0.641981	0.358019
1.7	0.691186	0.308814
1.8	0.73243	0.26757
1.9	0.767244	0.232756
2.	0.796812	0.203188
2.1	0.822065	0.177935
2.2	0.843739	0.156261
2.3	0.862423	0.137577
2.4	0.878596	0.121404
2.5	0.892645	0.107355
2.6	0.904889	0.0951109
2.7	0.915593	0.0844074
2.8	0.924975	0.0750254
2.9	0.933219	0.0667811
3.	0.94048	0.0595202

```
b = a[[All, {1, 3}]];
ListPlot[b]
```



- Graphics -

■ Exercício 3.60

```
tes = {800, 900, 950, 975};
μ1 = 1000;
μ2 = 1200;
μ3 = 1600;
r[x_, y_, z_] = x (1 - (1 - y) (1 - z));
MatrixForm[Table[{tes[[i]],
   N[r[Exp[-tes[[i]] / μ1], Exp[-tes[[i]] / μ2], Exp[-tes[[i]] / μ3]], 5]}, {i, 1, 4}]]
```

$$\begin{pmatrix} 800 & 0.36330 \\ 900 & 0.31428 \\ 950 & 0.29204 \\ 975 & 0.28145 \end{pmatrix}$$

$.95^{.8}$

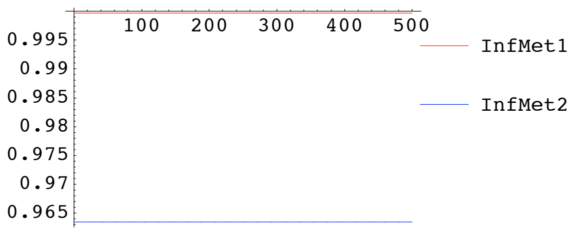
0.959796

■ Exercício 3.61

$\text{liminf}_1[t\_] = 1 - \left(1 - .05^{\frac{t}{500}}\right)^2;$

$\text{liminf}_2[t\_] = (1 - (1 - .05^2))^{\frac{t}{500}};$

```
Plot[{liminf1[t], liminf2[t]}, {t, 0, 500},
 PlotStyle → {RGBColor[1, 0, 0], RGBColor[0, 0, 1]},
 PlotLegend → {"InfMet1", "InfMet2"},
 LegendPosition → {.9, -.1}, LegendShadow → None]
```



- Graphics -

$$\left(\frac{1}{1000}+\frac{1}{1200.}\right)^{-1}$$

545.455