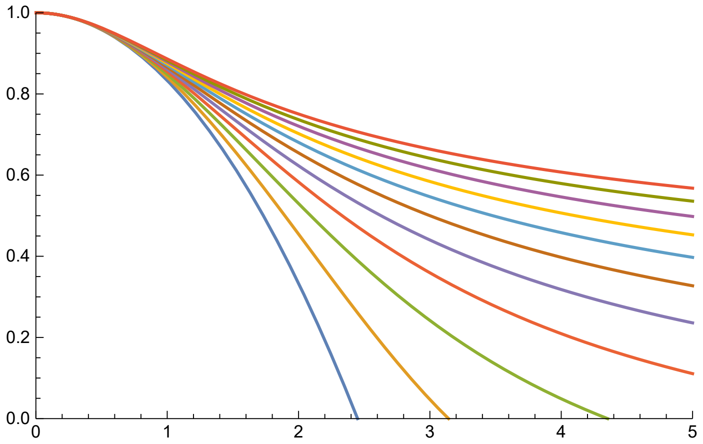
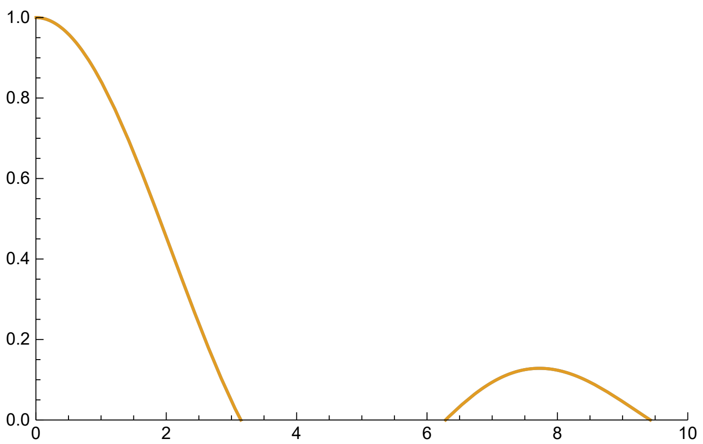
```
ξmin = 0.00001;
ξmax = 5;
soln = ParametricNDSolve[{∂ξ (ξ^2 θ'[ξ]) == -ξ^2 θ[ξ]^n,
   θ[ξmin] == 1, θ'[ξmin] == 0}, θ, {ξ, ξmin, ξmax}, {n}]
Plot[Evaluate[Table[θ[n][ξ] /. soln, {n, 0, 10, 1}]],
 {ξ, ξmin, ξmax}, PlotRange → {{ξmin, ξmax}, {0, 1}}]
```

{θ → ParametricFunction[Expression: θ Parameters: {n}]}



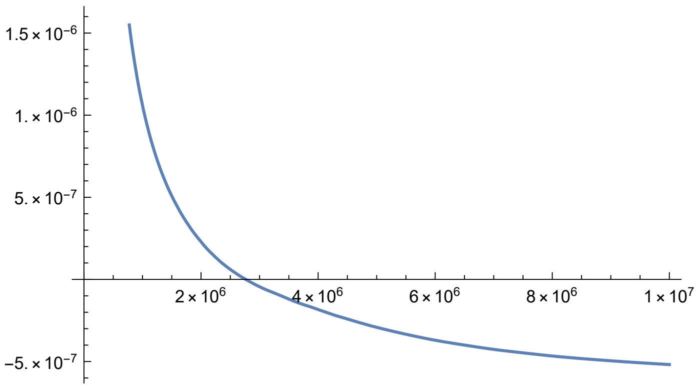

```
n = 1;
ξmin = 0.00001;
ξmax = 10;
s = NDSolve[{∂ξ (ξ^2 θ'[ξ]) == -ξ^2 θ[ξ]^n, θ[ξmin] == 1, θ'[ξmin] == 0},
  θ, {ξ, ξmin, ξmax}]
Plot[{Evaluate[θ[ξ] /. s], Sin[ξ] / ξ}, {ξ, ξmin, ξmax},
 PlotRange → {{ξmin, ξmax}, {0, 1}}]
```

{{θ → InterpolatingFunction[Domain: {{0.00001, 10.}} Output: scalar]}}



```
n = 4.99999;
ξmin = 0.00001;
ξmax = 10 000 000;
s = NDSolve[{ ∂ξ (ξ^2 θ'[ξ]) == -ξ^2 Abs[θ[ξ]]^n, θ[ξmin] == 1, θ'[ξmin] == 0},
  θ, {ξ, ξmin, ξmax}]
Plot[Evaluate[θ[ξ] /. s], {ξ, ξmin, ξmax}, PlotRange → Automatic]
```

{{θ → InterpolatingFunction[Domain: {{0.00001, 1. × 10^7}} Output: scalar]}}



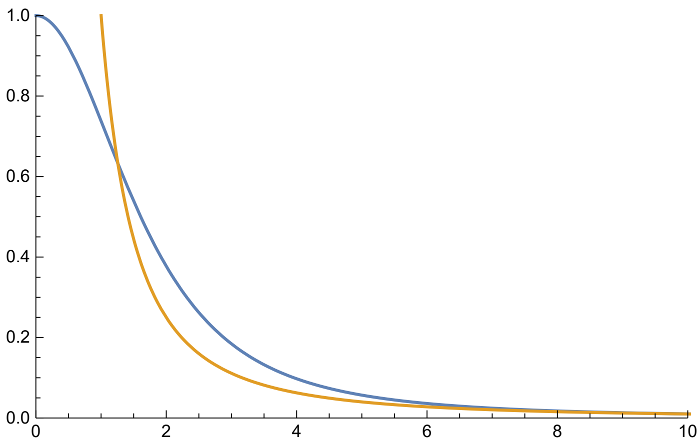
"isothermal (ρ is normalized to

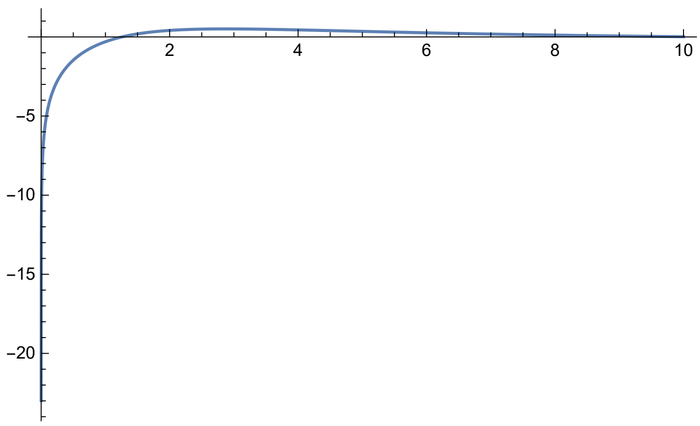
its center value and ξ=r/α with $\alpha=\sqrt{\frac{P_c}{2\pi G \rho_c^2}}$)"

"at large r always $\rho/\rho_c=1/\xi^2$"

```
ξmin = 0.00001;
ξmax = 10;
s = NDSolve[{ ∂ξ (ξ^2 ρ'[ξ] / ρ[ξ]) == -2 ξ^2 ρ[ξ], ρ[ξmin] == 1, ρ'[ξmin] == 0},
   ρ, {ξ, ξmin, ξmax}]
Plot[{Evaluate[ρ[ξ] /. s], 1/ξ^2}, {ξ, ξmin, 20},
 PlotRange → {{0, ξmax}, {0, 1}}]
Plot[Evaluate[Log[ξ^2 ρ[ξ]] /. s], {ξ, ξmin, ξmax}, PlotRange → All]
```

{{ρ → InterpolatingFunction[Domain: {{0.00001, 10.}} Output: scalar]}}

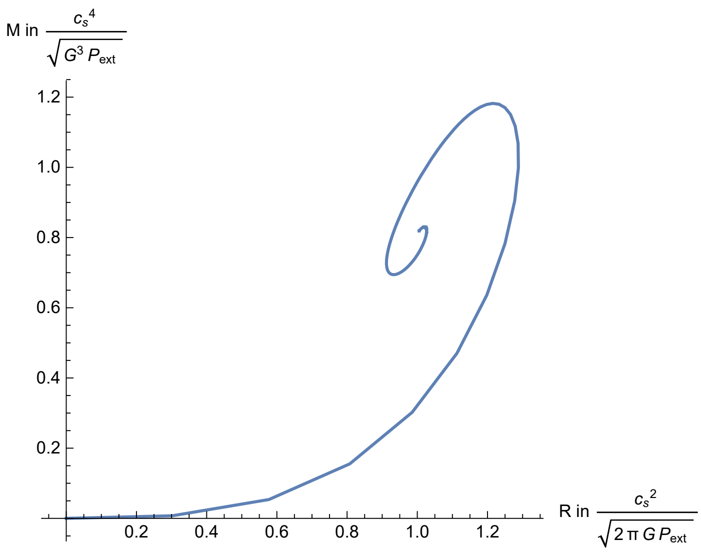


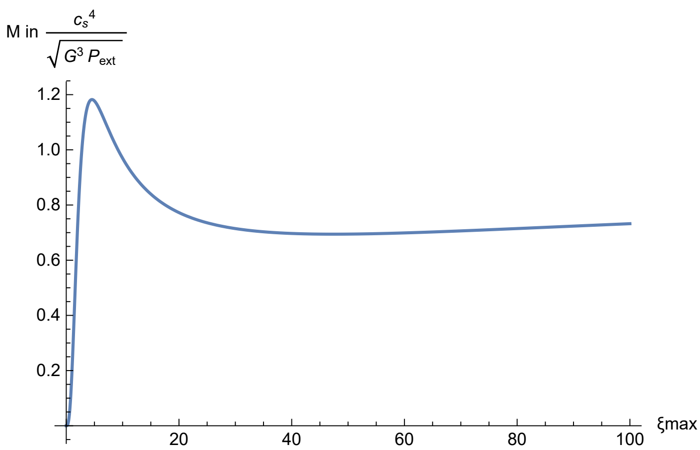


"bonor-ebert mass in units of $\frac{c_s{}^4}{\sqrt{G^3\, P_{ext}}}$, radius in units of $\frac{c_s{}^2}{\sqrt{2\,\pi\, G\, P_{ext}}}$"

```
ξmin = 0.00001;
sol = ParametricNDSolve[{∂ξ (ξ^2 ρ'[ξ] / ρ[ξ]) == -2 ξ^2 ρ[ξ],
    ρ[ξmin] == 1, ρ'[ξmin] == 0}, ρ, {ξ, ξmin, ξmax}, {ξmax}]
ParametricPlot[Evaluate[{ξmax Sqrt[ρ[ξmax][ξmax]],
     Sqrt[2 ρ[ξmax][ξmax] / π] ∫_{ξmin}^{ξmax} ξ^2 ρ[ξmax][ξ] dξ} /. sol],
  {ξmax, ξmin, 1000}, PlotRange → All, AxesLabel →
  {"R in cs^2/Sqrt[2 π G Pext]", "M in cs^4/Sqrt[G^3 Pext]"}]
Plot[Evaluate[Sqrt[2 ρ[ξmax][ξmax] / π] ∫_{ξmin}^{ξmax} ξ^2 ρ[ξmax][ξ] dξ /. sol],
  {ξmax, ξmin, 100}, PlotRange → All,
  AxesLabel → {"ξmax", "M in cs^4/Sqrt[G^3 Pext]"}]
```

{ρ → ParametricFunction[Expression: ρ Parameters: {ξmax}]}





N[$\sqrt{2/\pi}$]

```
0.797885
```