Curva de Rotação ESO 116-G12

Utilitários

Tabelas

In[2]:=
```
data =
  Import["C:\\Users\\Leoleo\\Desktop\\TCC\\Mathematica\\Fitting\\116.dat"];
 importa  constante
RC_total = Table[{data[[i, 1]], data[[i, 3]]}, {i, 1, 15}];
          tabela
RC_gas = Table[{data[[i, 1]], data[[i, 4]]}, {i, 1, 15}];
         tabela
Erro = Table[data[[i, 5]], {i, 1, 15}];
         tabela
radii = Part[Transpose[data], 1];
         parte  transposição
Vel = Part[Transpose[data], 3];
       parte  transposição
err = Part[Transpose[data], 5];
       parte  transposição


TableForm[data, TableHeadings → {{""}, {"Raio", "", "Vtotal", "Vgas", "Erro"}}]
 forma de tabela        cabeçalhos de tabela
```

Out[9]//TableForm=

	Raio		Vtotal	Vgas	Erro
	0.295522	7.58904	20.94	-0.234178	3.4
	0.985821	7.79329	39.95	-1.95065	3.29
	1.62537	8.47973	51.54	-1.68024	2.96
	2.18881	9.15955	67.92	5.43454	3.45
	3.17687	9.76846	80.22	13.5993	2.93
	3.76791	9.48569	83.33	18.0705	3.08
	4.35896	8.74732	91.38	21.8567	2.83
	4.8903	7.95629	101.65	24.2219	5.4
	6.19403	6.20847	104.77	27.7912	4.21
	7.16418	5.25717	108.62	29.5757	2.1
	8.0597	4.68539	108.48	30.9882	2.1
	8.95522	4.27244	108.73	33.3072	2.1
	9.85075	3.43065	110.24	36.6602	2.1
	10.7463	1.87414	110.63	38.4926	2.33
	11.6418	0.66706	111.52	36.585	4.74

Valores de Parâmetros

Ajuste Não Linear

In[57]:=
```
Clear[f]
```
apaga

```
VDisk[r_, M_] := 1/(2 Rd) (G (M * 10^9) (r/Rd)^2)
    (BesselI[0, r/(2 Rd)] BesselK[0, r/(2 Rd)] - BesselI[1, r/(2 Rd)] BesselK[1, r/(2 Rd)]);
```
função I de Bessel · função K de Bessel · função I de Bessel · função K de Bessel

```
VDark[r_, R_, P_] := 1/r 6.4 G ((P * 10^7) R^3)
    (1/2 Log[(r/R)^2 + 1] + Log[r/R + 1] - ArcTan[r/R]);
```
logaritmo · logaritmo · arco tangente

```
h[r_, R_, P_, M_] := Sqrt[VDisk[r, M] + VDark[r, R, P]];
```
raiz quadrada

```
Rd := 1.7;

Fit2 = NonlinearModelFit[RCtotal,
```
ajusta a um modelo não linear

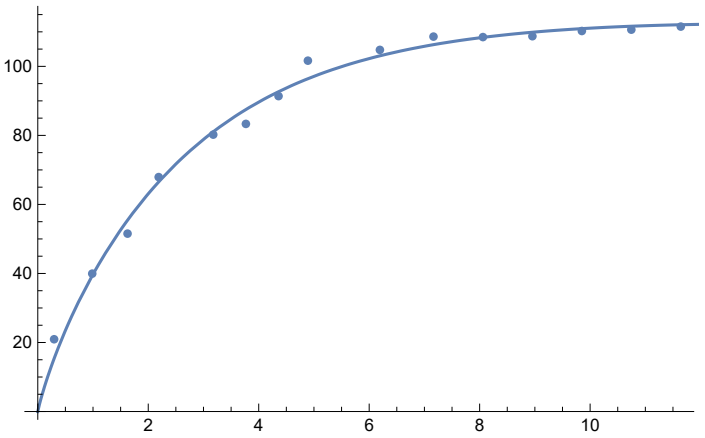
```
  h[r, R, P, M], {{M, 0.1, 10}, {P, 0.1, 10}, {R, 1, 10}}, r]
Fit2["ParameterTable"]
Show[ListPlot[RCtotal], Plot[Fit2[r], {r, 0, 100}, AxesOrigin → {0, 0}]]
```
gráfico de uma lista de v·· · gráfico · origem dos eixos

Out[62]=
$$\text{FittedModel}\left[\sqrt{905.618\, r^2\, (\ll 1\gg) + \frac{129439.\, (\ll 1\gg)}{r}}\right]$$

Out[63]=

	Estimate	Standard Error	t-Statistic	P-Value
M	2.06848	0.687315	3.00951	0.0108728
P	4.63667	1.15787	4.00447	0.00174759
R	4.66305	0.626713	7.44048	7.83508×10^{-6}

Out[64]=



In[65]:=

```
j[r_, R_, P_, M_] := Sqrt[VDisk[r, M] + VDark[r, R, P] + Igas[r]^2]
                     raiz quadrada
Fit3 = NonlinearModelFit[RC_total, j[r, R, P, M],
       ajusta a um modelo não linear
  {{M, 0.1, 10}, {P, 0.1, 10}, {R, 1, 10}}, r, Weights → 1 / err^2]
                                                  pesos
Fit3["ParameterTable"]
Show[ListPlot[RC_total], Plot[Fit3[r], {r, 0, 100}, AxesOrigin → {0, 0}]]
mostra gráfico de uma lista de v·· gráfico                origem dos eixos
```

Out[66]=

$$\sqrt{\left(911.561\, r^2\, (\ll 1\gg) + \frac{\ll 19\gg\, (\ll 1\gg)}{r} + \text{InterpolatingFunction}\left[\text{Domain: } \{\{0.296,\ 11.6\}\} \text{ Output: scalar}\right][r]^2\right)}$$

Out[67]=

	Estimate	Standard Error	t-Statistic	P-Value
M	2.08205	0.735815	2.82959	0.0151873
P	4.51678	1.32533	3.40803	0.0051921
R	4.40809	0.670834	6.57106	0.0000264688

InterpolatingFunction::dmval : Input value {0.00204286} lies outside the range of data in the interpolating function. Extrapolation will be used. >>

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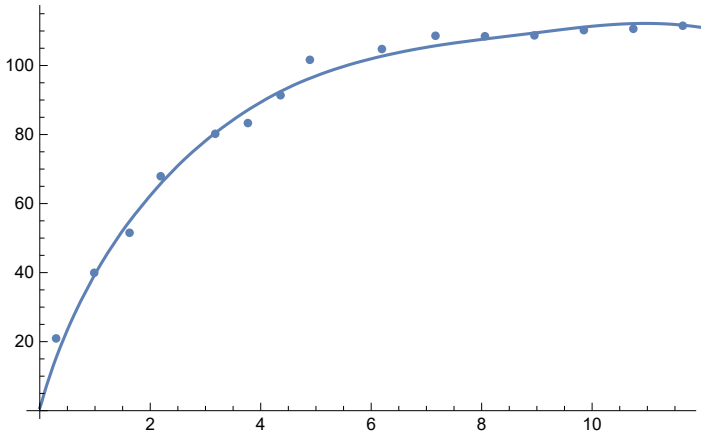
InterpolatingFunction::dmval : Input value {0.00204286} lies outside the range of data in the interpolating function. Extrapolation will be used. >>

General::stop : Further output of InterpolatingFunction::dmval will be suppressed during this calculation. >>

Out[68]=



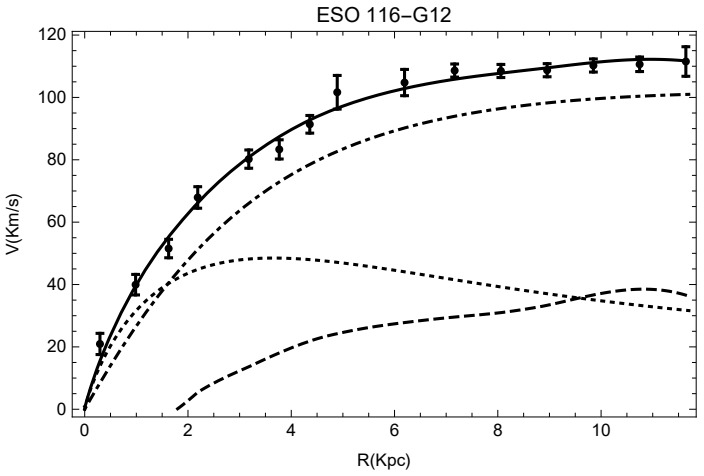
Gráficos do Ajuste

In[69]:=

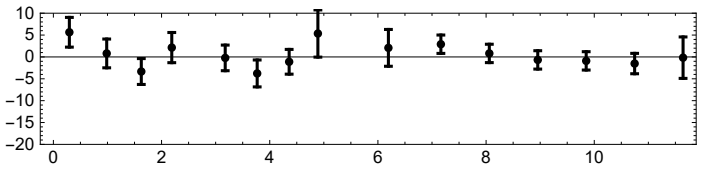
```
FINAL = Plot[Vt[r] /. {Md → 2.17 * 10^9, Rd → 1.7, Ro → 4.42, Po → 4.48 × 10^7},
          gráfico
    {r, 0, 11.6}, PlotStyle → Black, PlotRange → Automatic];
                  estilo do gráfico  preto  intervalo do grá··  automático

Show[CRtot, RCstars, RChalo, FINAL, Gas, Frame → True,
 mostra                                  quadro  verdadeiro
  PlotRange → {{0, 11.6}, {0, 115}}, PlotLabel → "ESO 116-G12",
                                          etiqueta de gráfico
  FrameLabel → {"R(Kpc)", "V(Km/s)"}]
  legenda do quadro

FITERRO = Table [{data[[i, 1]], Fit3["FitResiduals"][[i]]}, {i, 15}];
           tabela

ErrorListPlot[{Table[{FITERRO[[i]], ErrorBar[Erro[[i]]]}, {i, 15}]},
               tabela

  PlotStyle -> Black, MeshStyle -> PointSize[Large],
  estilo do gráfico  preto  estilo de malha  tamanho do···  grande

  PlotRange → {-20, 10}, Frame -> True, AspectRatio → 0.2]
  intervalo do gráfico  quadro  verd···  quociente de aspecto
```

InterpolatingFunction::dmval : Input value {0.000236971} lies outside the range of data in the interpolating function. Extrapolation will be used. >>

Out[70]=



Out[72]=



In[73]:=
```
chi2[P_, R_, M_] :=
 N[Plus @@ Table[(Vel[[i]] - j[radii[[i]], M, P, R])^2 / (err[[i]])^2,
   {i, Dimensions[radii][[1]]}]]
BestFit = Timing[NMinimize[{chi2[M, P, R],
    M > 1 && M < 50 && P > 1 && P < 10 && R > 1 && R < 10}, {M, P, R}]]
```

Out[74]=
```
{1.04688, {10.129, {M → 4.51677, P → 2.08206, R → 4.40809}}}
```

In[75]:=
```
10.129 / 12
```

Out[75]=
```
0.844083
```