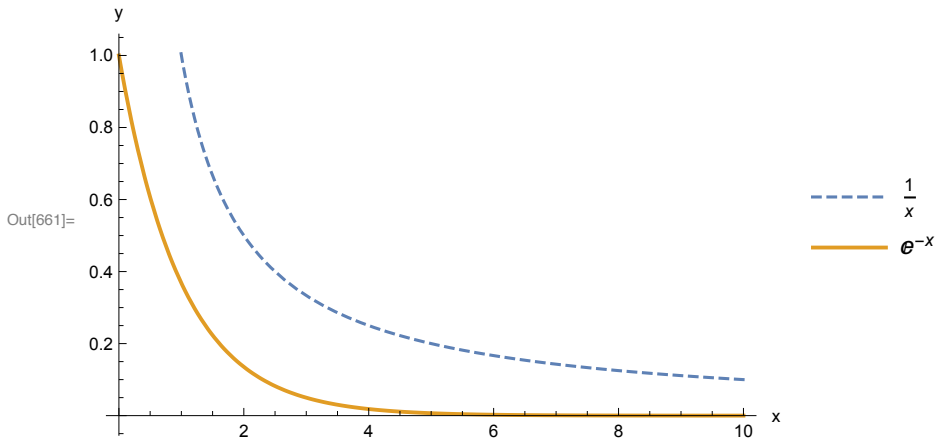


```
In[661]:= comparacao = Plot[{1 / x, Exp[-x]}, {x, 0, 10}, PlotLegends → {1 / x, Exp[-x]},
    PlotStyle → {Dashed, Thick}, AxesLabel → {"x", "y"}]
Export[NotebookDirectory[] <> "Images/X1-vs-Exponencial.pdf", comparacao]
```



```
Out[662]= /Users/Rogiel/Documents/GitHub/ufrgs-instrumentacao-lab4/Resources/Mathematica/
    Images/X1-vs-Exponencial.pdf
```

```
In[663]:= data = {{16, 3340}, {16, 3330}, {18, 3000}, {18, 3000}, {20, 2810}, {20, 2770},
    {22, 2590}, {22, 2530}, {24, 2380}, {24, 2400}, {26, 2180}, {26, 2160},
    {28, 1990}, {28, 1970}, {30, 1790}, {30, 1770}, {32, 1650}, {32, 1640},
    {34, 1540}, {34, 1520}, {36, 1360}, {36, 1380}, {38, 1310}, {38, 1300},
    {40, 1210}, {40, 1180}, {42, 1110}, {42, 1090}, {44, 1020}, {44, 990},
    {46, 950}, {46, 930}, {48, 860}, {48, 880}, {50, 810}, {50, 790},
    {52, 740}, {52, 740}, {54, 690}, {54, 680}, {56, 630}, {56, 630},
    {58, 580}, {58, 580}, {60, 560}, {60, 550}, {62, 520}, {62, 510},
    {64, 470}, {64, 480}, {66, 460}, {66, 440}, {68, 420}, {68, 420},
    {70, 380}, {70, 380}, {72, 360}, {72, 360}, {74, 340}, {74, 330}};
data[[All, 1]] = data[[All, 1]] + 273;
fitted = NonlinearModelFit[data, R0 * Exp[β * (1 / T)], {R0, β}, T]
```

```
Out[665]= FittedModel[ 0.00430432 e3920.77/T ]
```

```

In[666]:= linear = Vs * 
$$\frac{R1 * Rs - R3 * R1}{(R2 + R3) * (R1 + Rs)}$$
 /. {Rs -> 1 / (1 / RL + 1 / (RT + Rs))}

linearizado = linear /. {R1 -> 530, R2 -> 530,
  R3 -> 423, RL -> 550, Rs -> 227, RT -> fitted[T + 273], Vs -> 2000};

medido = {{18, 50.7}, {20, 43.8}, {22, 38.1},
  {24, 31.1}, {26, 23.9}, {28, 18.6}, {30, 9.8}, {32, 2.1}, {34, -8},
  {36, -15.7}, {38, -23.7}, {40, -36.1}, {42, -42.9}, {44, -53.9}};

model = LinearModelFit[medido, T, T]
model["FitResiduals"]

idealLinearModel = LinearModelFit[
  {{18, linearizado /. {T -> 18}}, {44, linearizado /. {T -> 44}}}, x, x];

esperado = Show[
  Plot[linearizado, {T, 18, 44}, PlotStyle -> Thick],
  Plot[idealLinearModel[T], {T, 18, 44}, PlotStyle -> Dashed],
  AxesLabel -> {"Temperatura (°C)", "Tensão de saída (mV)"}
]
Export[NotebookDirectory[] <> "Images/NTC-Linear-Esperado.pdf", esperado]

obtido = Show[
  Plot[linearizado, {T, 18, 44}, PlotStyle -> {Thick, Black}],
  Plot[idealLinearModel[T], {T, 18, 44}, PlotStyle -> {Dashed, Gray}],
  ListPlot[medido, PlotStyle -> Red],
  AxesLabel -> {"Temperatura (°C)", "Tensão de saída (mV)"}
]
Export[NotebookDirectory[] <> "Images/NTC-Linear-Obtido.pdf", obtido]

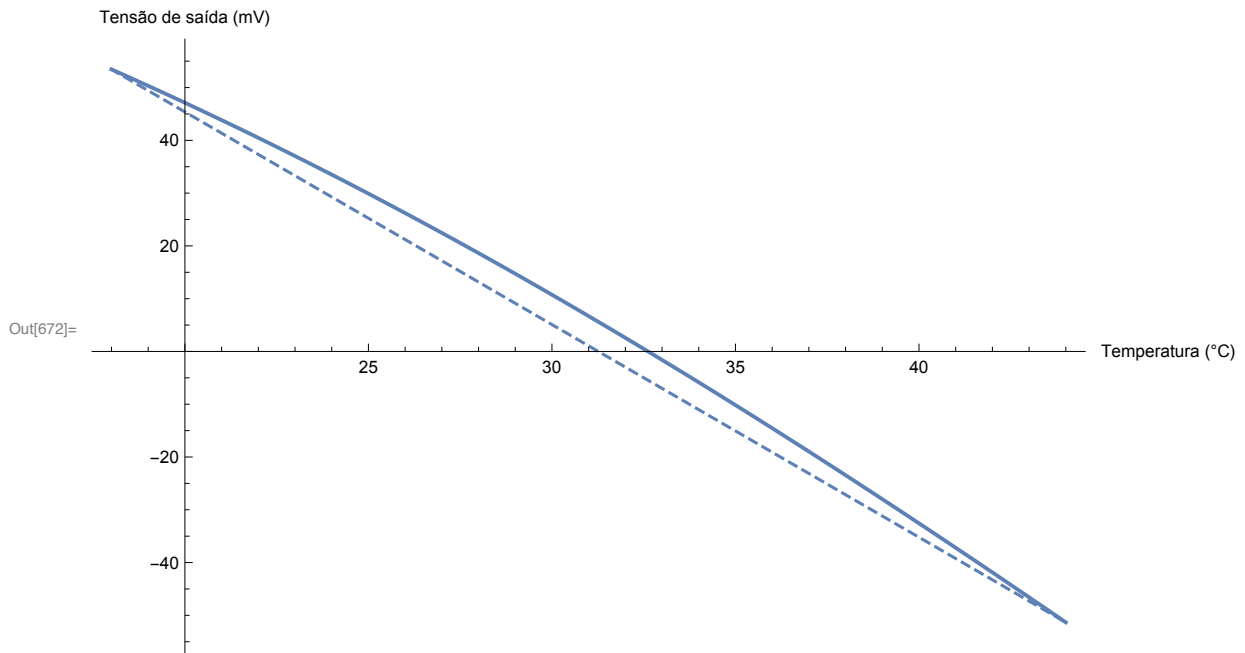
Grid[Table[{T, linearizado /. {T -> T}}, {T, 18, 44, 2}]]

```

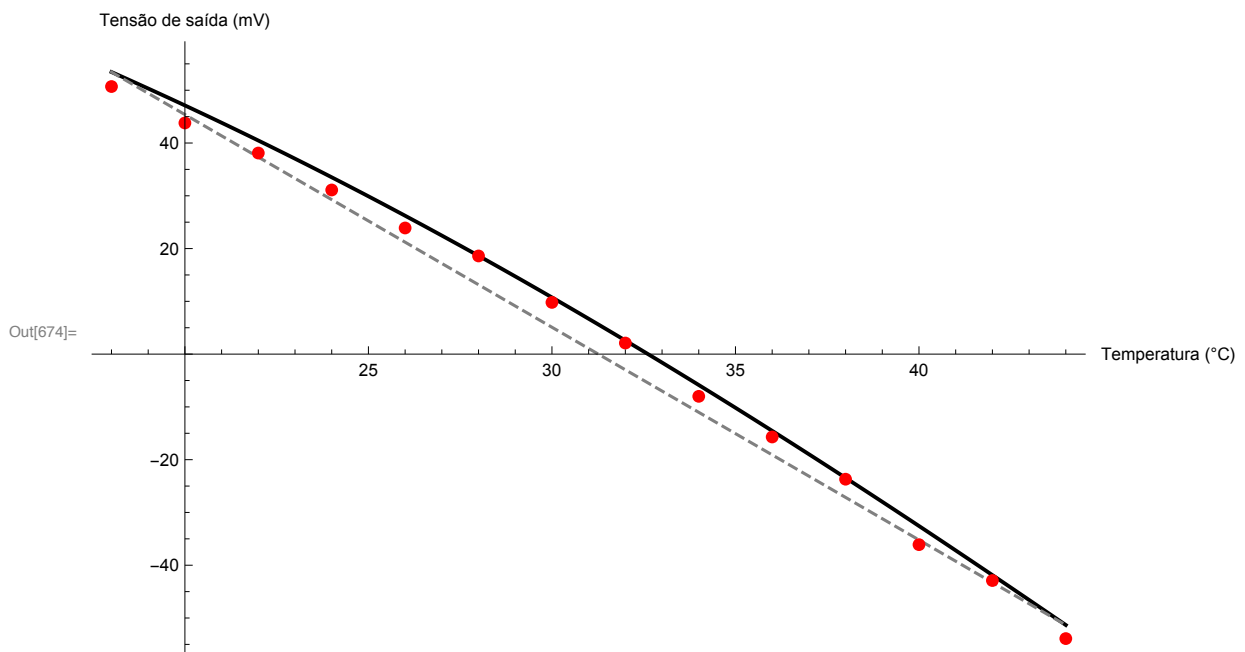
$$\text{Out[666]} = \frac{\left(-R1 R3 + \frac{R1}{\frac{1}{RL} + \frac{1}{Rs + RT}}\right) Vs}{(R2 + R3) \left(R1 + \frac{1}{\frac{1}{RL} + \frac{1}{Rs + RT}}\right)}$$

Out[669]= FittedModel[127.054 - 4.01143 T]

Out[670]= {-4.14857, -3.02571, -0.702857, 0.32, 1.14286, 3.86571, 3.08857, 3.41143, 1.33429, 1.65714, 1.68, -2.69714, -1.47429, -4.45143}



Out[673]= /Users/Rogiel/Documents/GitHub/ufrgs-instrumentacao-lab4/Resources/Mathematica/Images/NTC-Linear-Esperado.pdf



Out[675]= /Users/Rogiel/Documents/GitHub/ufrgs-instrumentacao-lab4/Resources/Mathematica/Images/NTC-Linear-Obtido.pdf

```
18  53.4488
20  47.1248
22  40.4763
24  33.507
26  26.2232
28  18.6333
30  10.7481
Out[676]= 32  2.58107
34  -5.85242
36  -14.5346
38  -23.4457
40  -32.5642
42  -41.8668
44  -51.3289

In[677]:= Export[NotebookFileName[EvaluationNotebook[]] <> ".pdf", EvaluationNotebook[]];
```