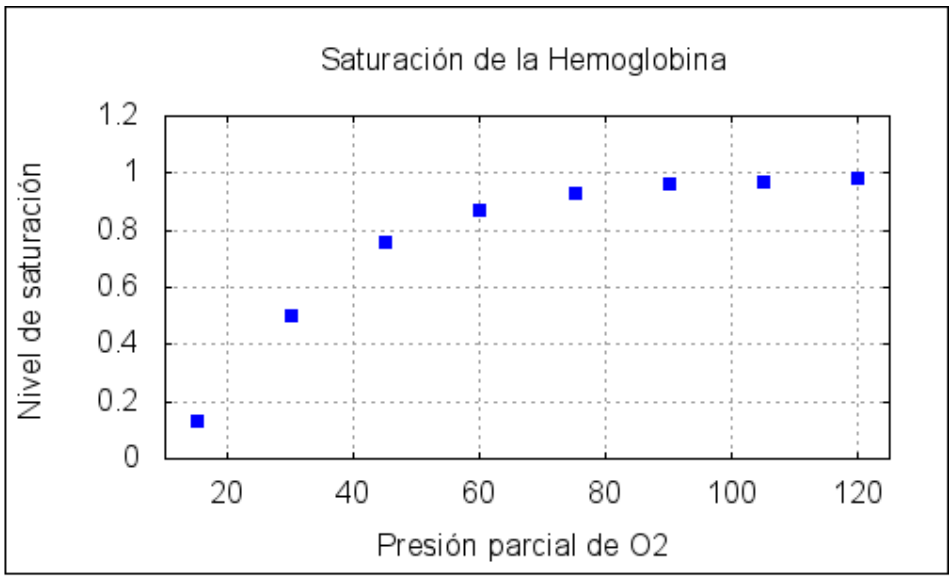
2)

```
(%i1) P:[15,30,45,60,75,90,105,120];
      S:[0.13,0.5,0.76,0.87,0.93,0.96,0.97,0.98];


(%o1) [15,30,45,60,75,90,105,120]
(%o2) [0.13,0.5,0.76,0.87,0.93,0.96,0.97,0.98]

(%i3) PS:transpose(matrix(P,S));

                [ 15   0.13 ]
                [ 30   0.5  ]
                [ 45   0.76 ]
                [ 60   0.87 ]
(%o3)           [ 75   0.93 ]
                [ 90   0.96 ]
                [ 105  0.97 ]
                [ 120  0.98 ]

(%i4) wxdraw2d(point_type=5,points(PS),xrange=[10,125],yrange=[0,1.2],
      title="Saturación de la Hemoglobina",
      xlabel="Presión parcial de O2",ylabel="Nivel de saturación",
      grid=true);
```

(%t4)



(%o4)

I

(%i5) log10(x):=log(x)/log(10);

$$(\%o5)\quad \log10(x):=\frac{\log(x)}{\log(10)}$$

(%i6) P1:log10(P),numer;

```
(%o6) [1.176091259055681,1.477121254719662,1.653212513775343,
1.778151250383643,1.8750612633917,1.954242509439325,2.021189299069
2.079181246047624]
```

(%i7) S1:log10(S/(1-S)),numer;

```
(%o7) [-0.82557590031178,0.0,0.50060235056919,0.82557590031178,
1.123384908539678,1.380211241711606,1.509650479546582,1.69019608002
```

(%i8) PS1:transpose(matrix(P1,S1));

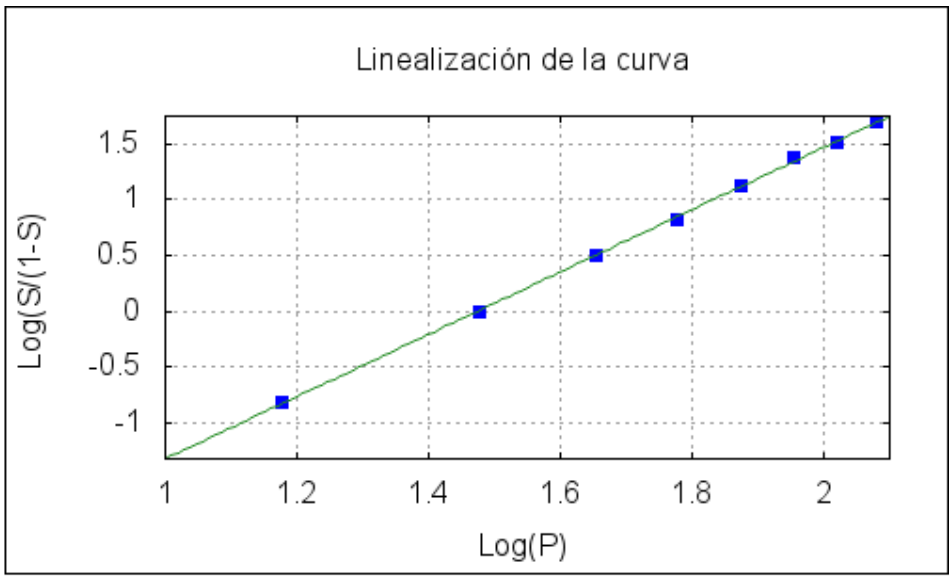
(%o8)
$$\begin{bmatrix} 1.176091259055681 & -0.82557590031178 \\ 1.477121254719662 & 0.0 \\ 1.653212513775343 & 0.50060235056919 \\ 1.778151250383643 & 0.82557590031178 \\ 1.8750612633917 & 1.123384908539678 \\ 1.954242509439325 & 1.380211241711606 \\ 2.021189299069938 & 1.509650479546582 \\ 2.079181246047624 & 1.690196080028513 \end{bmatrix}$$

(%i9) simple_linear_regression(PS1);

(%o9)
$$\begin{array}{l} \textit{SIMPLE LINEAR REGRESSION} \\ \textit{model} = 2.794910459399235\, x - 4.120566313834946 \\ \textit{correlation} = 0.99974946808492 \\ \textit{v\_estimation} = 4.2629061982703422\, 10^{-4} \\ \textit{b\_conf\_int} = [2.73240200789264, 2.85741891090583] \\ \textit{hypotheses} = \textit{H0: b = 0 ,H1: b \# 0} \\ \textit{statistic} = 109.4075978713248 \\ \textit{distribution} = [\textit{student\_t}, 6] \\ \textit{p\_value} = 3.9305003696199492\, 10^{-11} \end{array}$$

(%i10) wxdraw2d(point_type=5,points(PS1),color=forest_green,
explicit(2.794910459399235*x-4.120566313834946,x,1,2.1),
title="Linealización de la curva",
xlabel="Log(P)",ylabel="Log(S/(1-S)",grid=true);

(%t10)



(%o10)

-->

II)

(%i11) n:2.794910459399235;

(%o11) 2.794910459399235

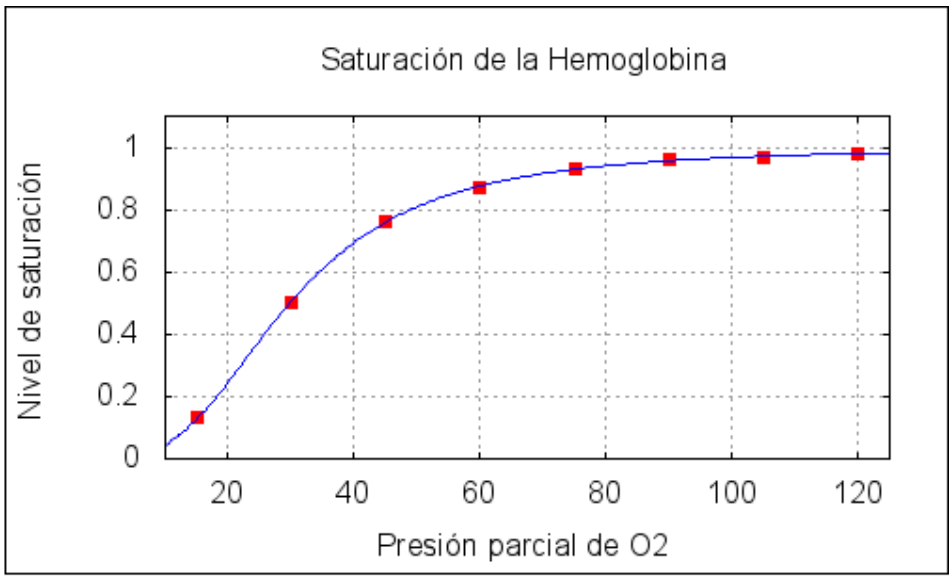
(%i12) k:10^(4.120566313834946/n);

(%o12) 29.80647860414898

III)

```
(%i13) wxdraw2d(point_type=5,color=red,points(PS),
       color=blue,explicit(x^(n)/(k^n+x^n),x,10,125),
       yrange=[0,1.1],title="Saturación de la Hemoglobina",
       xlabel="Presión parcial de O2",ylabel="Nivel de saturación",
       grid=true);
```

(%t13)



(%o13)

Como ya predecía el coeficiente de correlación,
la recta se ajusta muy bien a los datos.

IV)

```
(%i14) load(lsquares);
```

(%o14)
C:/maxima/maxima_installed/Maxima-5.28.0-2/share/maxima/5.28.0-2/sha

```
(%i15) mse:lsquares_mse(PS,[x,y],y=x^a/(b^a+x^a));
```

$$(\%o15)\quad \frac{\sum_{i=1}^{8}\left(PS_{i,2}-\frac{PS_{i,1}^{a}}{PS_{i,1}^{a}+b^{a}}\right)^{2}}{8}$$

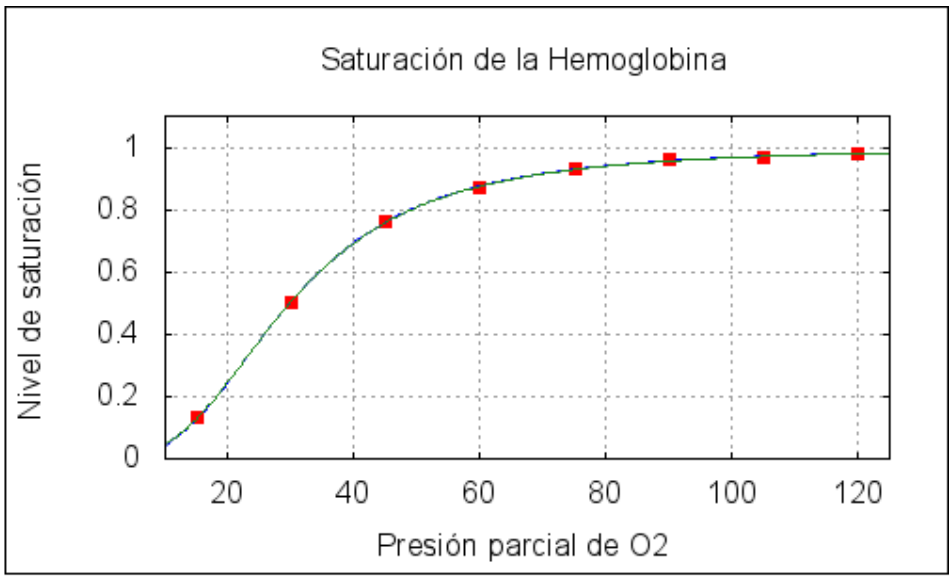
```
(%i16) lsquares_estimates_approximate(mse,[a,b],
       initial=[2.794910459399235,29.80647860414898,tol=0.001]);
```

```
*************************************************
  N=    2   NUMBER OF CORRECTIONS=25
        INITIAL VALUES
 F=  9.458921784099149D-06   GNORM=  1.176359876232790D-04
*************************************************
   I  NFN      FUNC                    GNORM                   STEPLE
   1    3      8.326863376633946D-06   2.224759558341585D-05   1.6456
 THE MINIMIZATION TERMINATED WITHOUT DETECTING ERRORS.
 IFLAG = 0
(%o16) [[a=2.776281709013045,b=29.81174264543849]]
```

```
(%i17) n1:2.776281709013045;k1:29.81174264543849;


(%o17) 2.776281709013045
(%o18) 29.81174264543849
```

```
(%i19) wxdraw2d(point_type=5,color=red,points(PS),
       color=blue,explicit(x^(n)/(k^n+x^n),x,10,125),
       color=forest_green,explicit(x^(n1)/(k1^n1+x^n1),x,10,125),
       yrange=[0,1.1],title="Saturación de la Hemoglobina",
       xlabel="Presión parcial de O2",ylabel="Nivel de saturación",grid=true);
```

(%t19)



(%o19)

El primer ajuste por regresión era tan bueno que las dos rectas prácticamente coinciden.

Created with wxMaxima.