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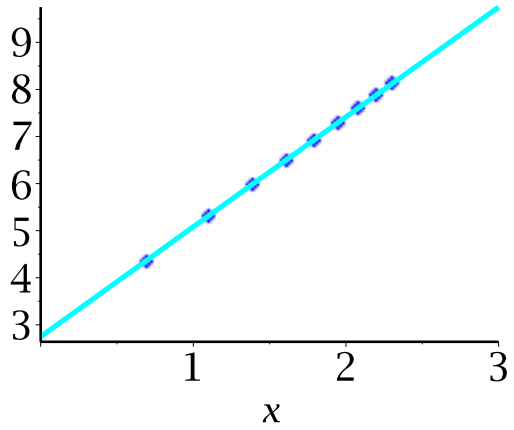
> ###### Shell model.Total Atomic binding energy using Clementi-
  Raimondi factors
> restart:
> ##### Physical constants
  hbar:=6.582119*10^(-16):
  Bohr_radius:=0.52917721092*10^(-10):
  E1:=-13.60569253:
  clight:=299792458:
  alpha:=1/137.035999:
  m_e:=0.510998928*10^6/c^2:
> ################## para no olvidar los cuadrados defino
  ###### in Maple % means "the previous result"
  f:=x->x^2:
  ### He
  E1*f(1.6875)/1^2*2: [2,%];
                          [2, -77.48867074]                    (1)
> #### Li(3)
  E1*(2*f(2.6906)/1^2+f(1.279)/2^2): [3,%];
                          [3, -202.5563390]                    (2)
> #### Be(4)
  E1*(2*f(3.6848)/1^2+2*f(1.912)/2^2): [4,%];
                          [4, -394.3388762]                    (3)
> #### B(5)
  E1*(2*f(4.6795)/1^2+2*f(2.5762)/2^2+f(2.4214)/2^2): [5,%];
                          [5, -660.9596207]                    (4)
> #### C(6)
  E1*(2*f(5.6727)/1^2+2*f(3.2166)/2^2+2*f(3.1358)/2^2): [6,%];
                          [6, -1012.929240]                    (5)
> #### N(7)
  E1*(2*f(6.6651)/1^2+2*f(3.8474)/2^2+3*f(3.8340)/2^2): [7,%];
                          [7, -1459.523814]                    (6)
> #### O(8)
  E1*(2*f(7.6579)/1^2+2*f(4.4916)/2^2+4*f(4.4532)/2^2): [8,%];
                          [8, -2002.827197]                    (7)
> #### F(9)
  E1*(2*f(8.6501)/1^2+2*f(5.1276)/2^2+5*f(5.1000)/2^2): [9,%];
                          [9, -2657.288364]                    (8)
> #### Ne(10)
  E1*(2*f(9.6421)/1^2+2*f(5.7584)/2^2+6*f(5.7584)/2^2): [10,%];
                          [10, -3432.151941]                   (9)
> with(plots):
  g:=x->log(x):
> data1:=[[g(2),log(77.48867074)],[g(3), log(202.5563390)], [g(4),
  log(394.3388762)],
```

```
[g(5), log(660.9596207)], [g(6), log(1012.929240)], [g(7), log
(1459.523814)],
[g(8), log(2002.827197)], [g(9), log(2657.288364)], [g(10), log
(3432.151941)]
] ;
p1:=pointplot(data1,symbol=diamond,symbolsize=20,color=g):
p2:=plot(2.75+7/3*x,x=0..3,color=cyan,thickness=2): display({p1,
p2});
```

$$data1 := [[\ln(2), 4.350131742], [\ln(3), 5.311018065], [2\ln(2), 5.977210632], [\ln(5), 6.493692750], [\ln(6), 6.920601650], [\ln(7), 7.285865507], [3\ln(2), 7.602315060], [2\ln(3), 7.885061470], [\ln(10), 8.140942731]]$$




```
> with(CurveFitting): Interactive(data1,Z);
> #### result by least squares
  2.721701701+2.348421306*Z
> exp(2.721701701): evalf(%);
```

$$e^{2.721701701 + 2.348421306\,Z}$$

$$15.20617661 \tag{10}$$

```
> ## Thomas-Fermi: exponent of the energy:
  7/3.;
```

$$2.333333333 \tag{11}$$

```
> ### With this shell model,the energy is
  15.20617661*Z^2.348421306;
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$$15.20617661\,Z^{2.348421306} \tag{12}$$

```
> ##### O sea, quitando cifras...
> E(Z)=15.21*Z^2.35;
```

$$E(Z) = 15.21\,Z^{2.35} \tag{13}$$