1.

```
restart
d := [5.998, 5.997, 5.996, 5.997, 5.996, 5.996, 5.997, 5.999, 5.995, 5.996]:
delta_ins := 0.004:
d_bar := 1/10 sum(d[i], i = 1..10) # d的平均值 = 5.996700000
u_a_d := sqrt( sum((d[i] - d_bar)^2, i = 1..10) / (10 - 1) ) # 贝塞尔公式 =
0.001159501809
u_a := sqrt( sum((d[i] - d_bar)^2, i = 1..10) / (10 · (10 - 1)) ) # 算术平均值的A类标准不
确定度 = = 0.0003666666666
u_b := delta_ins / sqrt(3) : # B类标准不确定度
evalf(u_b) # 求值 = 0.002309401077
u_c := sqrt(u_a^2 + u_b^2) # 合成标准不确定度 = = 0.002338327987
```

2.

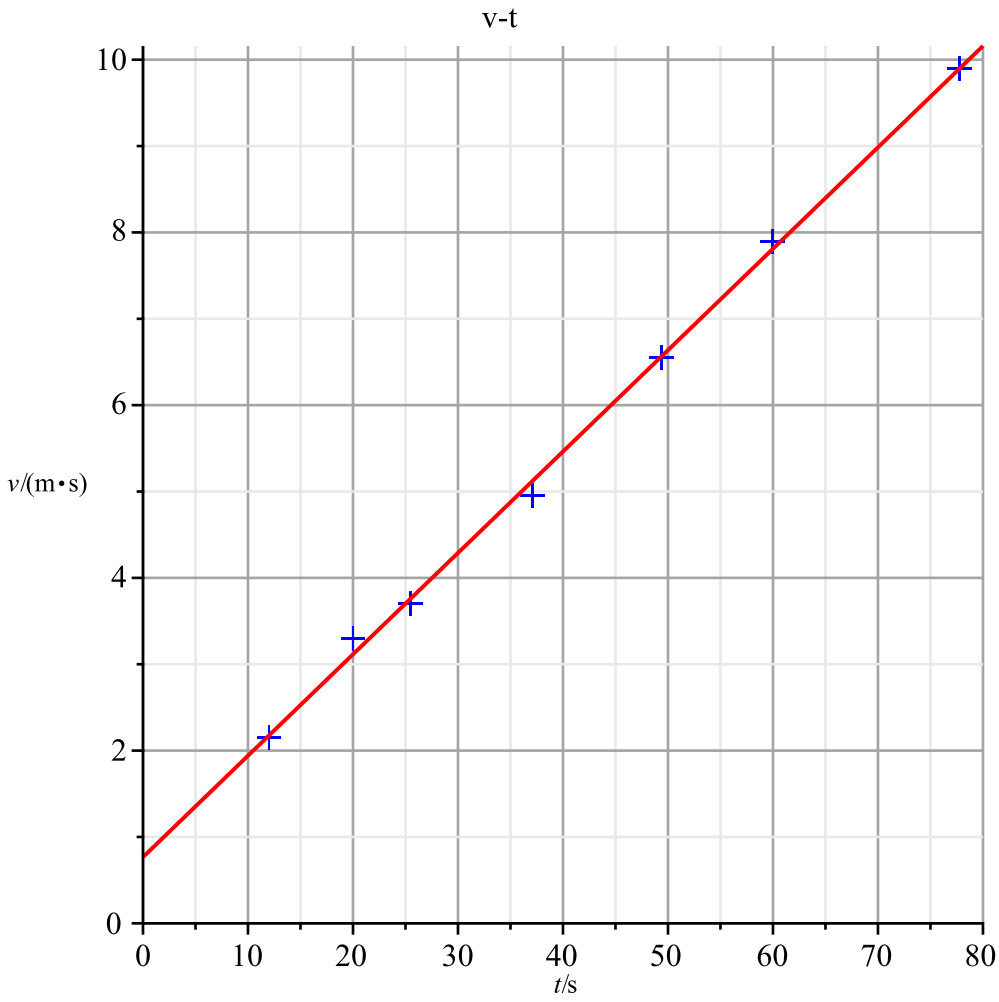
```
restart
l := [4.8101, 8.0549, 11.3014, 14.5493, 17.7988, 21.0497]:
delta_l := 1/3((l[4] - l[1]) + (l[5] - l[2]) + (l[6] - l[3])) / (3·10) # 逐差法=
0.3247933333
```

3.

```
restart
with(plots):
with(Statistics):
t_v := [[12.0, 2.15], [20.0, 3.30], [25.5, 3.70], [37.1, 4.95], [49.4, 6.55],
    [60.0, 7.90], [77.8, 9.90]] : # 时间—速度样本点
ft := LinearFit([t, 1], Vector([seq(t_v[i][1], i = 1 .. nops(t_v))]),
    Vector([seq(t_v[i][2], i = 1 .. nops(t_v))]), t) : # 最小二乘法

v0 := coeffs(ft)[1] # 初速度 = 0.766660899698654
```

```
a := coeffs(ft)[2] # 加速度 = 0.117400190568167
dots := pointplot(t_v, style = point, symbol = cross, symbolsize = 16, color
    = blue,
                    labels = [typeset(t, "/", "s"), typeset(v, "/", "(m•s)")],
                    title = "v-t", gridlines = true, view = [0 ..80, 0 ..10]) :
line := plot(ft, t = 0 ..80, color = red) :
display(dots, line) # 画图
```



4.

```
restart
with(Statistics) :
n := 6 : # 样本容量
d_vals := [23.532, 22.840, 22.375, 21.912, 21.556, 21.226] :
d_prime_vals := [26.679, 27.366, 27.865, 28.316, 28.674, 29.030] :
d_vals := Vector(d_prime_vals) − Vector(d_vals) :
[seq(d_vals)] # 直径 =
```

[3.14700000000000, 4.52600000000000, 5.49000000000000,
6.40400000000000, 7.11800000000000, 7.80400000000000]

lambda := $589.3 \cdot 10^{-6}$: # 波长/毫米

$sqrt\_m\_vals := Vector([seq(\mathrm{sqrt}(5\,i), i = 1 .. n)])$:

$ft := LinearFit([sqrt\_m, 1], sqrt\_m\_vals, d\_vals, sqrt\_m)$: # 最小二乘法

rho := $\dfrac{coeffs(ft)[2]^2}{4\ \mathrm{lambda}}$ # 曲率半径 = **872.156179791824**

$s_a := \mathrm{sqrt}\left(\dfrac{\dfrac{1}{Correlation(sqrt\_m\_vals, d\_vals)^2} - 1}{n-2}\right) coeffs(ft)[2]$:

斜率不确定度

$u := \dfrac{\mathrm{abs}(coeffs(ft)[2])}{2\ \mathrm{lambda}} s_a$ # 曲率半径不确定度 = **12.6727916951449**