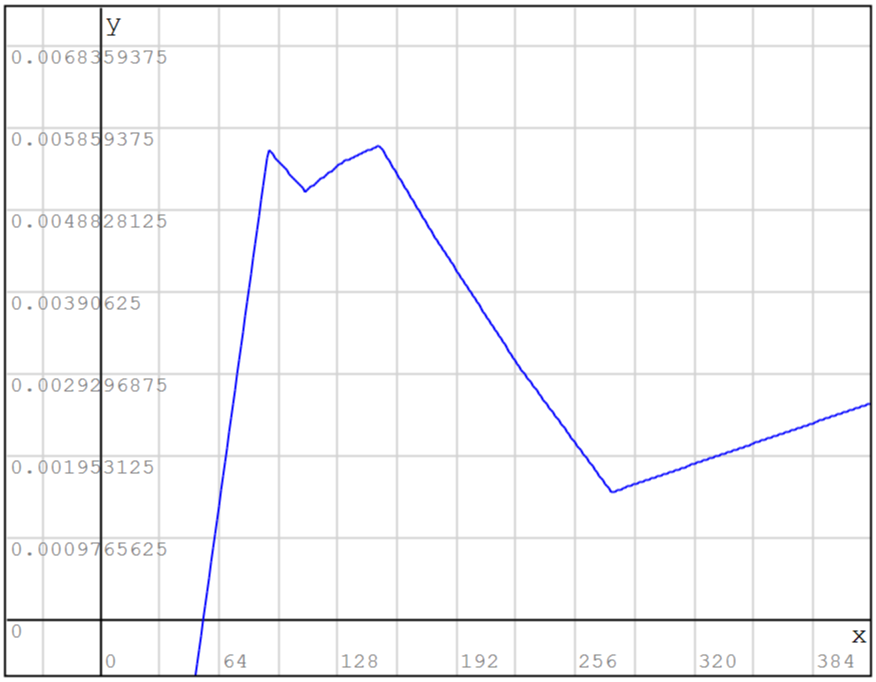
underlying data

Don't use x, leave it undefined. Have special mean for plots

$$xv := \begin{bmatrix} 70 \\ 90 \\ 110 \\ 130 \\ 150 \\ 180 \\ 225 \\ 275 \\ 325 \end{bmatrix} \qquad yv := \begin{bmatrix} 0.0024 \\ 0.0056 \\ 0.0051 \\ 0.00545 \\ 0.00565 \\ 0.00455 \\ 0.00302 \\ 0.00152 \\ 0.0019 \end{bmatrix}$$

This is a more practical definition for g. Can use linterp too

$$g1(x) := \mathrm{linterp}(xv, yv, x)$$



$g1(x)$

we introduce a formula for the approximation $a1 := 100 \cdot \sqrt{2 \cdot \pi}$

$$Wb(x) := \left(\frac{h1}{\sigma1 \cdot a1}\right) \cdot \exp\left(-\frac{(x-\mu1)^2}{2 \cdot \sigma1^2}\right) + \left(\frac{h2}{\sigma2 \cdot a1}\right) \cdot \exp\left(\frac{-(x-\mu2)^2}{2 \cdot \sigma2^2}\right) + \left(\frac{h3}{\sigma3 \cdot a1}\right) \cdot \exp\left(\frac{-(x-\mu3)^2}{2 \cdot \sigma3^2}\right)$$

$$Raz(x, h1, h2, h3, \mu1, \mu2, \mu3, \sigma1, \sigma2, \sigma3) := Wb(x) - yv$$

Here , where all parameters are undefined, except a1. Also, introduce x.

initial values of 9 parameters

$h1 := 0$ $h2 := 0$ $h3 := 0$

$\mu1 := 50$ $\mu2 := 100$ $\mu3 := 200$

$\sigma1 := 1$ $\sigma2 := 1$ $\sigma3 := 1$

10 parameters that need to be calculated, we set arbitrary values for now

$Sqmin := 1$ $hh1 := 0.15$ $hh2 := 0.7$ $hh3 := 0.40$

$\mu\mu1 := 90$ $\mu\mu2 := 160$ $\mu\mu3 := 350$

$\sigma\sigma1 := 19$ $\sigma\sigma2 := 50$ $\sigma\sigma3 := 80$

The difference between the original data and those calculated by the formula

the sum of the squares of the deviations of the initial data from the desired function

$$Sq(x, h1, h2, h3, \mu1, \mu2, \mu3, \sigma1, \sigma2, \sigma3) := \sum \left(\overrightarrow{(Raz(x, h1, h2, h3, \mu1, \mu2, \mu3, \sigma1, \sigma2, \sigma3))^2} \right)$$

introduce x here

$$Sq(xv, h1, h2, h3, \mu1, \mu2, \mu3, \sigma1, \sigma2, \sigma3) = 0.0002$$

This seems to be a very good value for the difference error.

we iterate through the parameters to minimize the sum of the squared deviations

```
while  h1 < 100
  h1 := h1 + 1
  while  h2 < 100
    h2 := h2 + 1
    while  h3 < 100
      h3 := h3 + 1
      while  μ1 < 200
        μ1 := μ1 + 1
        while  μ2 < 350
          μ2 := μ2 + 1
          while  μ3 < 500
            μ3 := μ3 + 1
            while  σ1 < 80
              σ1 := σ1 + 1
              while  σ2 < 100
                σ2 := σ2 + 1
                while  σ3 < 150
                  σ3 := σ3 + 1
                  Sq := Sq(xv, h1, h2, h3, μ1, μ2, μ3, σ1, σ2, σ3)
                  if  Sq < Sqmin
                    hh1 := h1/100
                    hh2 := h2/100
                    hh3 := h3/100
                    μμ1 := μ1
                    μμ2 := μ2
                    μμ3 := μ3
                    σσ1 := σ1
                    σσ2 := σ2
                    σσ3 := σ3
                    Sqmin := Sq
                  else
                    continue
```

Here in the loop, Sq should be calculated and compared with Sqmin. The parameters under which the condition is met are saved

Here the program should print the value of the smallest square of the deviation and the values of the 9 parameters at which this is achieved

$Sqmin = 0.0002$	$hh1 = 0.01$	$hh2 = 0.01$	$hh3 = 0.01$
	$\mu\mu1 = 51$	$\mu\mu2 = 101$	$\mu\mu3 = 201$
	$\sigma\sigma1 = 2$	$\sigma\sigma2 = 2$	$\sigma\sigma3 = 62$

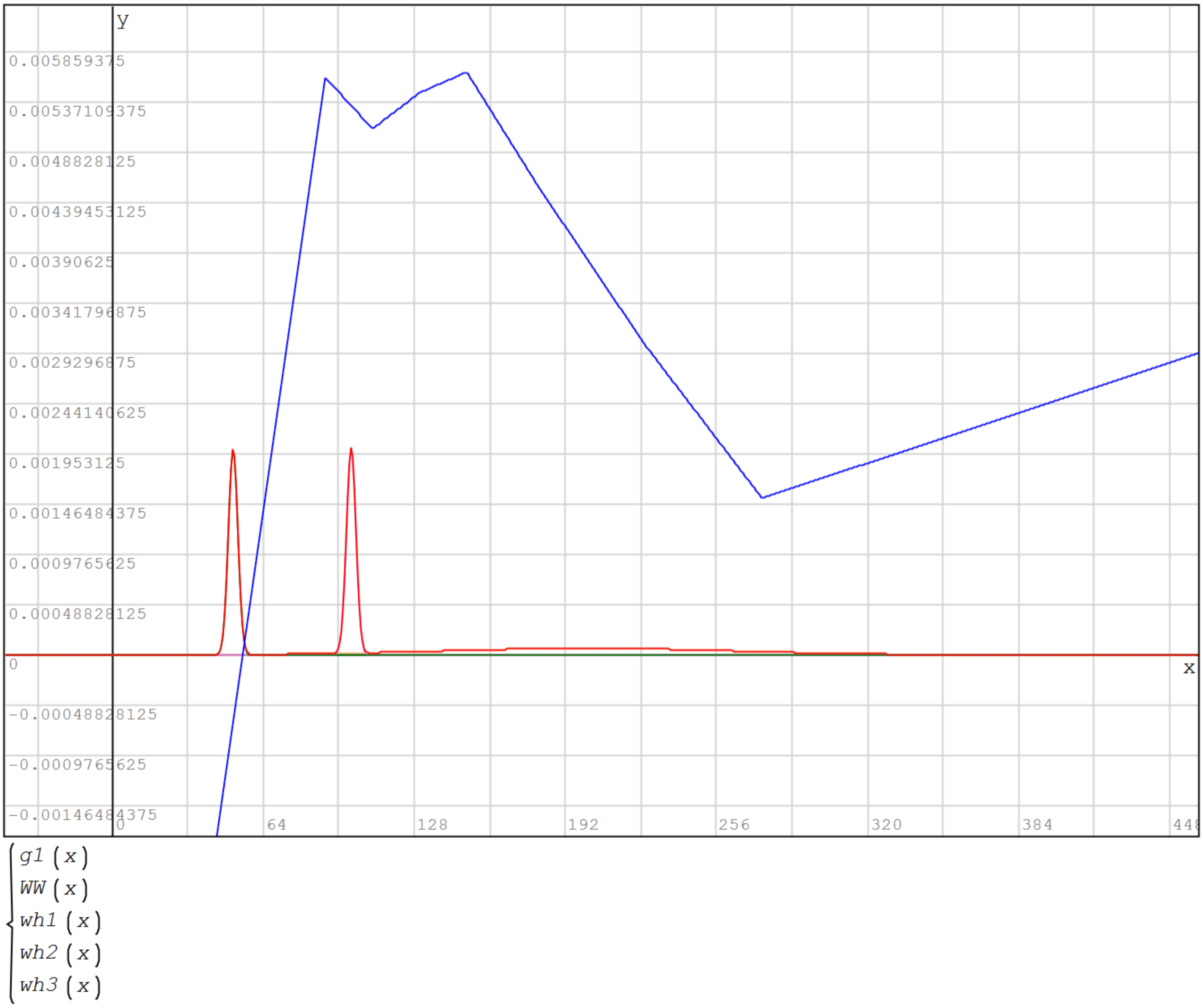
$$wh1(x) := \frac{hh1}{\sigma\sigma1 \cdot \sqrt{2 \cdot \pi}} \cdot \exp\left(-\frac{(x - \mu\mu1)^2}{2 \cdot \sigma\sigma1^2}\right)$$

Draw the resulting graphs.
Three normal distributions and their sum with different weights

$$wh2(x) := \frac{hh2}{\sigma\sigma2 \cdot \sqrt{2 \cdot \pi}} \cdot \exp\left(-\frac{(x - \mu\mu2)^2}{2 \cdot \sigma\sigma2^2}\right)$$

$$wh3(x) := \frac{hh3}{\sigma\sigma3 \cdot \sqrt{2 \cdot \pi}} \cdot \exp\left(-\frac{(x - \mu\mu3)^2}{2 \cdot \sigma\sigma3^2}\right)$$

$$WW(x) := wh1(x) + wh2(x) + wh3(x)$$

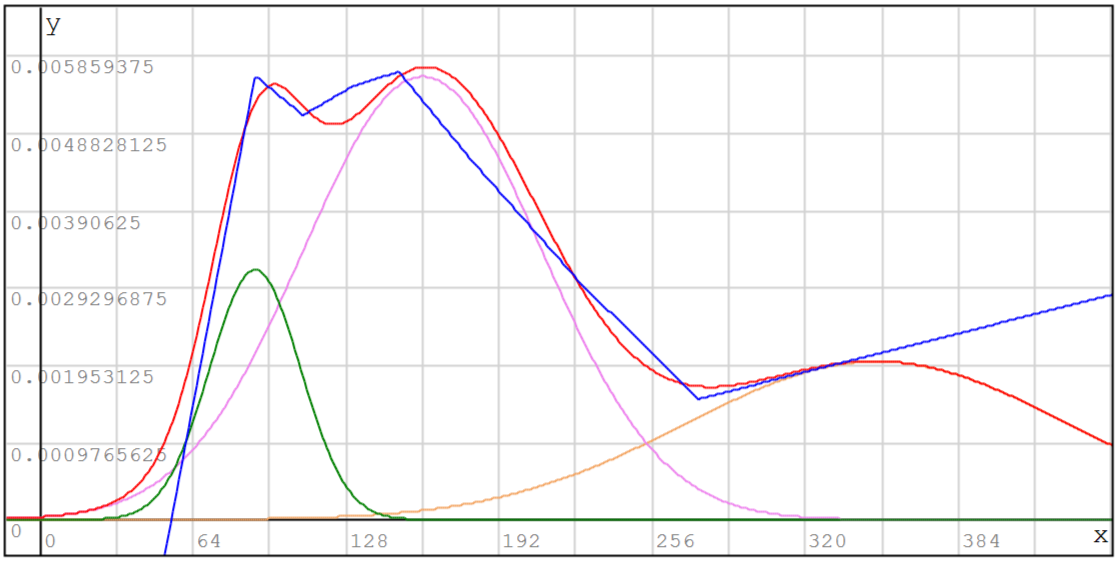


Above procedure have not reason for converge to a solution for the problem, try this other, but yours guess values seems to be a good solution for the problem.

$$\begin{bmatrix} hh1 \\ hh2 \\ hh3 \\ \mu\mu1 \\ \mu\mu2 \\ \mu\mu3 \\ \sigma\sigma1 \\ \sigma\sigma2 \\ \sigma\sigma3 \end{bmatrix} := \begin{bmatrix} 0.15 \\ 0.7 \\ 0.4 \\ 90 \\ 160 \\ 350 \\ 19 \\ 50 \\ 80 \end{bmatrix} \quad sol := \left| \ \text{NelderMead}\left(Sq\left(xv, h1a, h2a, h3a, \mu1a, \mu2a, \mu3a, \sigma1a, \sigma2a, \sigma3a\right), \begin{bmatrix} hh1 \\ hh2 \\ hh3 \\ \mu\mu1 \\ \mu\mu2 \\ \mu\mu3 \\ \sigma\sigma1 \\ \sigma\sigma2 \\ \sigma\sigma3 \end{bmatrix} \right) \right. \quad \begin{bmatrix} hh1 \\ hh2 \\ hh3 \\ \mu\mu1 \\ \mu\mu2 \\ \mu\mu3 \\ \sigma\sigma1 \\ \sigma\sigma2 \\ \sigma\sigma3 \end{bmatrix} := sol = \begin{bmatrix} 0.15 \\ 0.7 \\ 0.4 \\ 90 \\ 160 \\ 350 \\ 19 \\ 50 \\ 80 \end{bmatrix}$$

$$wh1(x) := \frac{hh1}{\sigma\sigma1 \cdot \sqrt{2 \cdot \pi}} \cdot \exp\left(-\frac{(x - \mu\mu1)^2}{2 \cdot \sigma\sigma1^2} \right) \qquad wh3(x) := \frac{hh3}{\sigma\sigma3 \cdot \sqrt{2 \cdot \pi}} \cdot \exp\left(-\frac{(x - \mu\mu3)^2}{2 \cdot \sigma\sigma3^2} \right)$$

$$wh2(x) := \frac{hh2}{\sigma\sigma2 \cdot \sqrt{2 \cdot \pi}} \cdot \exp\left(-\frac{(x - \mu\mu2)^2}{2 \cdot \sigma\sigma2^2} \right) \qquad WW(x) := wh1(x) + wh2(x) + wh3(x)$$



$$\begin{cases} g1(x) \\ WW(x) \\ wh1(x) \\ wh2(x) \\ wh3(x) \end{cases}$$