

(5.13) The α -activity of a mixture of astatine isotopes was measured at different times after their separation giving the following results: Calculate the half-lives and their activity at $t=0$.

The standard method is graphical, but here we used a numerical fitting by minimizing the residuals:

$i := 1 \dots 19$

$t_i :=$ $R_i :=$

12	756
17.2	725
23.1	638
30.0	600
37.7	545
47.5	494
59.5	435
73	380
87	341
102	288
121	256
140	215.5
161	178.5
184	150.7
211	127.3
243	101.9
276	84.9
308	68.2
340	55

$A1_i$

780.208
721.283
662.329
602.45
545.251
484.312
423.749
369.394
324.229
284.97
244.88
212.426
182.88
156.105
130.23
105.435
84.976
69.004
56.06

$a1 := 507$ $t1 := 107$

$a2 := 440$ $t2 := 24$

$$A1_i := a1 \cdot \exp\left(\frac{-\ln(2)}{t1} \cdot t_i\right) + A2_i$$

$$A2_i := a2 \cdot \exp\left(\frac{-\ln(2)}{t2} \cdot t_i\right)$$

