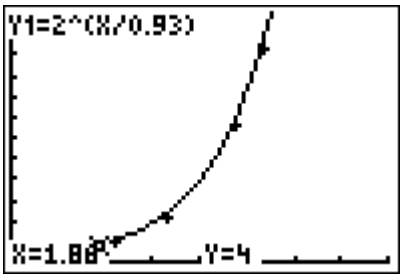
Chapter 7 Task Level 3 Sample Solution

a)

Time, t, (h)	Number of Bacteria, N	$\frac{N}{N_0}$
0	3 000	1
0.8	5 378	1.793
2.2	14 900	4.967
3.3	33 300	11.10
4.8	99 600	33.20
5.4	154 300	51.43

I plotted the points (t, $\frac{N}{N_0}$). Then I tried to fit a power of 2 as close as possible to the points. I found that $y = 2^{\frac{x}{0.93}}$ is a good fit. An estimate for the doubling time is 0.93 h.



b)

$$y = 2^{\frac{x}{D}}$$

Take logs of both sides:

$$\log y = \frac{x}{D}\log 2$$

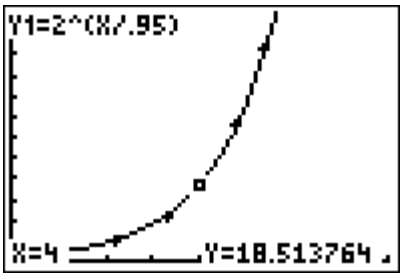
Substitute $x = 0.8$, $y = 1.793$.

$$\log 1.793 = \frac{0.8}{D}(\log 2)$$

$$D = \frac{0.8\log 2}{\log 1.793}$$

$$= 0.949\ 695$$

Check: Graph $y = 2^{\frac{x}{0.95}}$.



c) Exponential regression yields the function shown below. This is not a power of base 2, so it does not help to find the doubling time.