Sample Problem—Calculating Exponential Growth

Example

A population of 2500 yeast cells in a culture tube is growing exponentially. If the intrinsic growth rate r is 0.030 per hour, calculate:

(a) the initial instantaneous growth rate of the population

(b) the time it will take for the population to double in size

(c) calculate the size of the population after each of four doubling times.

Solution

(a) $r = 0.030$ per hour and $N = 2500$

$$\frac{dN}{dt} = rN$$

$$= 0.030 \times 2500$$

$$= 75 \text{ per hour}$$

When the population size is 2500 the instantaneous population growth rate is 75 per hour.

(b) $r = 0.030$

$$t_d = \frac{0.69}{r}$$

$$= \frac{0.69}{0.030}$$

$$= 23 \text{ hours}$$

The yeast population will double in size every 23 hours.

(c) $t_d = 23$ hours, initial population size is 2500

Table 2

Doubling times	Time (hours)	Population size
0	0	2500
1	23	5000
2	46	10 000
3	69	20 000
4	92	40 000