Exercise 2.10

For Gompertz law, we have $\mu_x = Bc^x$ so that

$$\frac{\mu_{50}}{\mu_{30}} = \frac{0.000344}{0.000130} = \frac{172}{65} = c^{20}.$$

This gives us $c = (172/65)^{1/20}$ and thus, we have

$$\begin{aligned}
{}_{10}p_{40} &= \exp\left\{-\int_0^{10} \mu_{40+s} ds\right\} \\
&= \exp\left\{-Bc^{40}\int_0^{10} c^s ds\right\} \\
&= \exp\left\{-\frac{B}{\log(c)} c^{40}(c^{10}-1)\right\} \\
&= \exp\left\{-\frac{0.000130(172/65)^{-3/2}}{\log(172/65)^{1/20}} (172/65)^2[(172/65)^{1/2}-1]\right\} \\
&= 0.9972799
\end{aligned}$$

This value gives the probability that a life (40) will survive to reach age 50.

* corrected on Dec 6, 2011 - thanks to W. Vercruysse