Quiz 3.2 **Solutions**

1. A bank offers a one year certificate of deposit at 6% compounded quarterly.
   (a) On a \$10,000 deposit, how much more would you make if it were compounded continuously?

Solution: At the quarterly rate, we get $P = 10000(1 + \frac{.06}{4})^4 \approx \$10,613.64$

For continuous compounding we have $P = 10000e^{.06} \approx \$10,618.37$.
The difference tells us we make \$4.73 more using continuous compounding. □

(b) On a \$10,000 deposit, what is the equivalent simple interest rate?

Solution: At the quarterly rate, we got $P = 10000(1 + \frac{.06}{4})^4 \approx \$10,613.64$. We wnat to see the euivalent result for simple interest (compounded once) so we have $10000(1 + r) = 10,613.64$. Solving for r gives us $r \approx 6.14\%$. □

2. Simplify the expression $10^{\log A}$.

Solution: Since $\log A$ is the exponent we raise 10 to in order to get A, it follows that 10 raised to this exponent will give us A. Alternatively, since $y = 10^x$ and $y = \log x$ are inverse functions, once undoes the other so we get back what we originally input, A. □

3. Solve $4(2.3)^x - 5 = 6$

Solution:

$$\begin{aligned} 4(2.3)^x - 5 &= 6 \\ 4(2.3)^x &= 11 \\ (2.3)^x &= \frac{11}{4} \\ \text{since } 10^{\log(2.3)\cdot x} &= 10^{\log\left(\frac{11}{4}\right)} \\ \text{it follows, } \log(2.3)\cdot x &= \log\left(\frac{11}{4}\right) \\ \text{so } x &= \frac{\log\left(\frac{11}{4}\right)}{\log(2.3)} \approx 1.215 \qquad \square \end{aligned}$$

4. The population of Trashtown was 2400 in 1980 and has grown at a continuous rate of 1.2% ever since. By what year will the population of Trashtown be 10,000?

Solution:

Since the intital population is 2400 and the continuous growth rate is 1.2%, we have $P = 2400e^{0.012t}$.
Solving $10000 = 2400e^{0.012t}$ gives us $t = \frac{\ln\left(\frac{10000}{2400}\right)}{0.012} \approx 118.9$ years. □