

NAME: _____

Math 103L: Interest (Sections 3.1-2)

These problems are a sample of the kinds of problems that may appear on the final exam. Some answers are included to indicate what is expected. Problems that require a summary statement are marked with **Sum**. The summary statements should be written in complete sentences and they should include the units of measurement for all quantities mentioned in the summary.

1. (Worked Example: READ IT!) Suppose we deposit \$7000 into an investment account. Simplify your answers as far as possible without a calculator. You may leave your answers in terms of exponentials and logarithmic expressions.

- (a) What amount will our account have after 15 years if it is invested at an annual rate of 5% compounded quarterly.

Answer:

We use the formula for future value:

$$A = P(1 + i)^n,$$

where $P = 7000$, $i = .05/4$, $n = 15 \times 4$.

$$A = 7000(1.0125)^{60}.$$

Summary: The account will have $7000(1.0125)^{60}$ dollars after 15 years.

- (b) What annual rate of interest is needed in order for the investment account to grow from \$7000 to \$14,000 in 10 years if interest is compounded continuously?

Answer:

We use the formula for continuous compounding:

$$A = Pe^{rt},$$

where $P = 7000$, $A = 14000$, $t = 10$ and r is unknown. Thus we must solve

$$14000 = 7000e^{10r}$$

for r :

$$\begin{aligned} 14000 &= 7000e^{10r} \\ e^{10r} &= 2 \\ 10r &= \log 2 \\ r &= \frac{\log 2}{10}. \end{aligned}$$

Summary: For an investment of \$7000 to grow to \$14000 in 10 years with continuous compounding, the rate must be $r = (\log 2)/10$.

2. \$5,000 is invested in an account that pays 6% compounded quarterly. The amount in the account after 20 years is $P(1 + a)^b$. Find the values of P, a, b :

$P =$ _____, $a =$ _____, $b =$ _____

3. Suppose we invest \$300.

- (a) Sum What amount will our account have after 7 years if it earns an annual rate of 3% compounded daily?
- (b) Sum How long will it take for our account to grow to \$1000 if it is invested at an annual rate of 3% compounded continuously?

4. An investment account earns 10% compounded quarterly. An initial investment of \$7,000 (present value) grows to \$14,000 (future value) in t years. Then $t = \frac{\log a}{b \log c}$. Find a, b, c .

$$a = \underline{\hspace{2cm}}, \quad b = \underline{\hspace{2cm}}, \quad c = \underline{\hspace{2cm}}$$