Math 131 Quiz 4 (B)

Name:.....Serial #:.....

Q.1: An initial investment of \$10,000 grows at an annual rate of 3.5% compounded monthly. Find how long it takes for the investment to amount to \$14,400.

Sol: Here $P = 10,000,\ S = 14,400,\ r = 3.5\% = 0.035,\ n = 12$. We need to find time (number of years) t.

The formula $S = P\left(1 + \frac{r}{12}\right)^{nt}$ gives $14,400 = 10,000\left(1 + \frac{0.035}{12}\right)^{12t}$. Dividing 14,400 by 10,000 and taking log on both sides.gives $12t\ \log\left(1 + \frac{0.035}{12}\right) = \log(1.44)$ or $t = \dfrac{\log(1.44)}{12\log\left(1 + \frac{0.035}{12}\right)} = 10.434.$

Q.2: A trust fund for a child's education is being set up by a single payment so that at the end of 15 years there will be \$40,000. If the fund earns interest at the rate of 6.75% compounded monthly, how much money should be paid into the fund initially?

Sol: Here $S = 40,000,\ r = 6.75\% = 0.0675,\ n = 12,\ t = 15$ years. We need to find the initial amount P.

The formula $P = S\left(1 + \frac{r}{12}\right)^{-nt}$ gives $P = 40000\left(1 + \frac{0.0675}{12}\right)^{-12(15)}. = 14574.$

Q.3: If a person deposits \$1500 in a savings account that pays an interest rate of r% compounded continuously, and the account has \$2000 at the end of 5 years, find the interest rate.

Sol: Here $P = 1500,\ S = 2000,\ t = 5\ years$ We need to find time the interest rate r.

The formula $S = Pe^{rt}$ gives $2000 = 1500e^{5r}$. Dividing 2000 by 1500 and taking natural logarithm on both sides.gives $r = \frac{\ln\left(\frac{20}{15}\right)}{5} = 0.05753\,6 = 5.7536\%$.

Q.4: Suppose a person deposits \$200 in a savings account at the end of every month. What is the value of the account at the end of five years if interest is at a rate of 10% compounded monthly?

Sol: Here $R = 200,\ n = 12$ (number of payment periods in one year), $t = 5\ years,\ r = \frac{10\%}{12} = \frac{0.10}{12} = 0.00833$

The formula $A = R\left[\dfrac{(1+r)^{nt} - 1}{r}\right] = 200\left(\dfrac{(1 + 0.00833)^{60} - 1}{0.00833}\right) = 15486.$