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a) First we must find the effective annual interest rate

$$ie = (1 + \frac{r}{m})^m - 1$$

$$= (1 + \frac{0.1}{12})^{12} - 1$$

$$= 0.104713$$

= 10.4713% per year compounded annually

$$F = P(1+i)^N$$

$$P = F / (1+i)^N$$

$$P = 5000 / (1 + 0.104713)^4$$

$$= \$3357.16$$

The initial investment was \$3357.16

b) Amount After First Year = $3357.16(1 + 0.08) = \$3625.73$

" " 2nd Year = $3625.73(1 + 0.09) = \$3952.05$

" " 3rd Year = $3952.05(1 + 0.10) = \$4347.26$

" " 4th Year = $4347.26(1 + 0.12) = \$4868.93$

Therefore if we had not locked into the saving account, we would have \$4868.93 after 4 years, \$137.07 less than \$5000 we did make.

c) $F = P(1+i)^N$

$$F/P = (1+i)^N$$

$$\log(F/P) = N \log(1+i)$$

$$\frac{\log(F/P)}{N} = \log(1+i)$$

$$10^{\frac{\log(F/P)}{N}} = 1+i$$

$$i = 10^{\frac{\log(F/P)}{N}} - 1$$

$$i = 10^{\frac{\log(\frac{4868.93}{3357.16})}{4}} - 1$$

$$i = 0.09740$$

Therefore the effective interest rate is 9.74%