Math 111 F09N01 - Quiz 5 Name: SOLUTIONS.
Nov 6 2009 Stu#:

Some useful formulas:

$$A = P\left(1 + \frac{r}{n}\right)^{nt} \qquad A = P\left[\frac{\left(1+\frac{r}{n}\right)^{nt} - 1}{\left(\frac{r}{n}\right)}\right]$$

$$1 + x + x^2 + x^3 + \cdots + x^{k-1} = \frac{1 - x^k}{1 - x}$$

(1) [**5 points**] Determine the effective rate of interest for 5% compounded quarterly.

$r = 5\% = 0.05$
$n = 4$
$t = 1$

$$\left(1 + \frac{0.05}{4}\right)^4 = 1 + R$$

$$\therefore \quad R = \left(1 + \frac{0.05}{4}\right)^4 - 1 \doteq 0.050945$$
$$\doteq \boxed{5.09\%}$$

(2) [**5 points**] What rate of interest compounded annually is required to triple an investment in 5 years?

$$\cancel{P}(1+r)^5 = 3\cancel{P}$$

$$1 + r = 3^{1/5}$$

$$r = 3^{1/5} - 1 \doteq 0.24573$$
$$\doteq \boxed{24.57\%}$$

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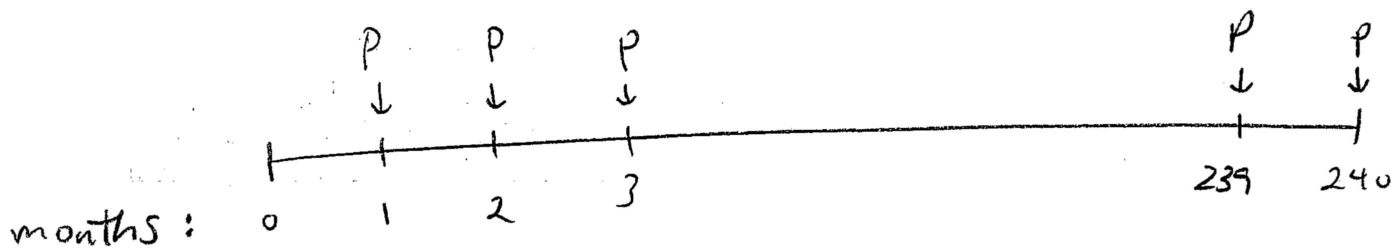
(3) [**5 points**] A person wishes to have \$350,000 saved in a pension fund 20 years from now. How much should be deposited at the end of each month into an account paying 9% compounded monthly to accumulate the \$350,000 over the 20 years (that is, over the 240 monthly payments)?

$A = 350{,}000$

$t = 20$

$n = 12$

$r = 9\% = 0.09$



$$\therefore\ 350{,}000 = P + P\left(1+\frac{0.09}{12}\right) + P\left(1+\frac{0.09}{12}\right)^2 + \cdots + P\left(1+\frac{0.09}{12}\right)^{239}$$

$$350{,}000 = P\left[1 + (1.0075) + (1.0075)^2 + \cdots + (1.0075)^{239}\right]$$

$$350000 = P\left[\frac{1-(1.0075)^{240}}{1-(1.0075)}\right]$$

$$\therefore\ P = 350{,}000\left[\frac{1-(1.0075)}{1-(1.0075)^{240}}\right]$$

$$P \approx \boxed{\$524.04}$$