10pts.

1: You want to start saving for a house. You decide that you will wait until you can save $30,000 for a down payment. You want to buy a house in 3 years. You put $d$ per month into an account yielding 6% compounded monthly. Find $d$.

\[
30,000 = d \left(1 + \frac{0.06}{12}\right)^{36} + d \left(1 + \frac{0.06}{12}\right)^{35} + \cdots + d \left(1 + \frac{0.06}{12}\right)^{1}
\]

\[
= \frac{d \left(1 + \frac{0.06}{12}\right) - d \left(1 + \frac{0.06}{12}\right)^{37}}{1 - \left(1 + \frac{0.06}{12}\right)^{1}} = d \left(1.005\right)^{-1}
\]

\[
d = \frac{30,000}{1.005 \left(1 - \left(1.005\right)^{-36}\right)} = 758.86
\]

Monthly payments of $758.86

10pts.

2: You invest in a mutual fund that promises an 8% return on your money. Inflation is 3%: what is the real growth rate of this investment? Explain where your formula comes from (start with $g_{new}$ and $g_{old}$ and show how they lead to the formula you need for this problem).

\[
\text{Real growth rate} = \frac{r-a}{1+a} = \frac{0.08 - 0.03}{1 + 0.03} = 0.0485
\]

\[
\text{Real growth rate} = \frac{g_{new} - g_{old}}{g_{old}} = \frac{\frac{p(1+r)}{m(1+a)} - \frac{p}{m}}{\frac{p}{m}} = \frac{1+r}{1+a} - 1
\]

\[
= \frac{1+r}{1+a} - \frac{1+a}{1+a} = \frac{r+1-a-1}{1+a} = \frac{r-a}{1+a}
\]