Exercise Set 1.8

(48.) Doubling Time. If an account has an annual yield of 8% compounded monthly, how long before the account doubles?

Step 1: I first chose to use the equation $2P = P(1+\frac{r}{n})^{nt}$. Since I'm trying to find how long it takes an account to double I chose to multiple P by 2. Note that $2P = P(1+\frac{r}{n})^{nt}$ where P = initial amount invested
r = interest rate (8%)
n = number of times compounded yearly (12)
t = required time in years

Step 2: Solve the equation for t.

$\frac{2P}{P} = \frac{P(1+\frac{.08}{12})^{12t}}{P}$ ← Divide by P and the Ps are canceled out of the equation

$2 = (1+\frac{.08}{12})^{12t}$ ← $.08 \div 12 \approx 0.00667 + 1 \approx 1.00667$

$2 = (1.00667)^{12t}$ ← next I will use logarithm to "undo" the 12t power

$\log 2 = \log(1.00667)^{12t}$ ← Logarithm Rule #3 States: $\log_a x^c = c\log_a x$

$\log 2 = 12t \log(1.00667)$ I applied this rule to the equation

$\log(1.00667) = \log(1.00667)$

$\frac{104.2663}{12} = \frac{12t}{12}$ ← To be left w/only 12t on one side of the equation, I multiplied each side by log(1.00667).

$8.6889 \approx t$ ← I then divide each side by 12 to get my answer.

Conclusion: If an account has an annual yield of 8% compounded monthly, it would take 9 years for the initial amount invested to double.