Presentation Problems 3

1. You invest *P* dollars into an account that pays annual interest rate r compounded *k* times a year *(k = 12* is monthly compounding). Compare how much money you have after *n* years for various k (e.g. - quarterly, monthly, daily) and against our differential equation $A'(t) = rA(t)$ with $A(0) = P$. (You can pick P, r, n.)
2. You have *S* dollars in an account that pays a yearly interest rate of *r*. You are going to withdraw *P* dollars a year from this account. How long will it take for your money to be gone? Write a differential equation that approximates this situation. Compare your answer with the answer for the differential equation. Consider the equilibrium solution and phase portrait of the differential equation.
3. Consider the two polynomials $p(x) = p_0 + \sum_{i=1}^{n} p_i x^i$ and $q(x) = q_0 + \sum_{i=1}^{n} q_i x^i$. Determine a sequence formula for the coefficients of $p(x)^2$ and $p(x)q(x)$. Apply it to the function $y = \frac{1}{1-x}\ (p(x))$ and $y = e^x\ (q(x))$
4. Use Euler's formula to give an algebraic and graphical analysis of what z^k for $z = a + bi$ with $a, b \epsilon R$ and $k \epsilon Z$ is. (You can do some specific examples with a, b.) What is $p(z)$?