Discrete Math 2 HW 3

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Problem 8.2.2 a-g.

a. Degree 2
b. No, there is no a_n term
c. No, cannot square a_{n-1}
d. Degree 3
e. No, cannot have non-constant coefficient
f. No, cannot have an n term
g. Degree 7

Problem 8.2.4 f,g.

f.
$r^2 + 6r + 9$
$(r + 3)(r + 3)$
$a_n = \alpha_1(-3)^n + \alpha_2(-3)^n n$
$3 = \alpha_1$
$-3 = \alpha_1(-3) + \alpha_2(-3)$
$\alpha_1 = 3$
$\alpha_2 = -2$
$a_n = 3(-3)^n - 2(-3)^n n$
g.
$r^2 - \frac{4}{5}r - \frac{1}{5} = 0$
$\frac{1}{5}(r - 1)(5r + 1)$
$a_n = \alpha_1(\frac{1}{5})^n + \alpha_2$
$2 = \alpha_1 + \alpha_2$
$8 = \frac{-\alpha_1}{5} + \alpha_2$
$-5 = \alpha_1$
$7 = \alpha_2$
$a_n = -5(\frac{-1}{5})^n + 7$

Problem 8.2.22.

$\alpha_1(-1)^n + \alpha_2(-1)^n n + \alpha_3(-1)^n n^2 + \alpha_4(2)^n + \alpha_5(2)^n n + \alpha_6(5)^n + \alpha_7(5)^n n + \alpha_8(7)^n$

Problem 8.supp.4 a,b,c.

a. $a_n = 3a_{n-1} - a_{n-2}$

$3a_{n-1}$ stands for the 2 new bacteria in the colony for each bacteria present the previous hour

$-a_{n-2}$ stands for the bacteria dieing after 2 hours

b. $(50 - 30\sqrt{5})(\frac{3}{2} - \frac{\sqrt{5}}{2})^n + (50 + 30\sqrt{5})(\frac{3}{2} + \frac{\sqrt{5}}{2})^n$

c. 10 hours

Problem 8.supp.6.

$a_n = a_{n-4} + a_{n-6} + a_{n-10}$
$a_4 = 1$
$a_6 = 1$
$a_{10} = 2$

Problem 8.supp.12.

$r^3 - 3r^2 + 3r - 1$
$(r-1)^3$
$\alpha_1 + \alpha_2 n + \alpha_3 n^2$
$\alpha_1 = 2$
$\alpha_2 + \alpha_3 = 0$
$2\alpha_2 + 4\alpha_3 = 2$
$\alpha_2 = -1$
$\alpha_3 = 1$
$a_n = n^2 - n + 2$

Problem az strings.

$25a_{n-1} + 25^{n-1}$
25^{n-1} stands for the number of valid strings that start with a z
$25a_{n-1}$ stands for the number of valid strings that don't start with a z
$a_0 = 1$
$a_1 = 26$
$a_n = 25^n + \frac{1}{25} n 25^n$
$a_5 = 11718750$