① Prove
$2^{2^n} = a(n-1)^2$

$(2^{2^{(n-1)}})^2 = a_1(n-1)^2$
$2^{2^n} = a_1(n-1)^2$ thus 2^{2^n} is true

$3 \cdot 2^{2^{n-1}} = a_2(n-1)^2$
$9 \cdot 2^{2^n} \neq a_2(n-1)^2$ $\quad 8 \cdot 2^{2^n}$ does not satisfy the equation
$3 \cdot 2^{2^n}$

②

$3a(n-1) - 2a(n-2) + n$

$r^2 - 3r + 2 = 0$
$(r-2)(r-1) = 0$ $\quad C_1 \cdot 1^n + C_2 \cdot 2^n = C_1 + C_2 \cdot 2^n$
$r = 2, 1$

$An^2 + Bn = 3[A(n-1)^2 + B(n-1)] - 2[A(n-2)^2 + B(n-2)] + n$

$3A(n^2 - 2n + 1) + 3B(n-1) - 2A(n^2 - 4n + 4) - 2B(n-2) + n$
$An^2 + (2A + B + 1)n + (-5A + B)$
$A : A$
$B = 0 \quad A = -1/2 \quad\quad -1/2\, n^2 - 5/2\, n$
$A = 0 \quad B = -5/2$

$C_1 + 2^n \cdot C_2 - 1/2\, n^2 - 5/2\, n$
$a(0) = 2 \quad\quad C_1 + C_2 = 2 \quad\quad C_1 = -2$
$a(1) = 6 \quad\quad C_1 + 2_2 = 6 \quad\quad C_2 = 4$

$-2 + 4 \cdot 2^n - 1/2\, n^2 - 5/2\, n$

③ $a(n) = 2a(n-1) + 2a(n-2) - 2a(n-3) + 2$

$r^3 - 2r^2 - 2r + 2$

1	1	-2	-2	2
		1	-1	-3
	1	-1	-3	-1

$r = -1.17 \quad r_2 = 0.68 \quad r_3 = 2.84$

$A r_1^n + B r_2^n + C r_3^n$

$A = 0.501 \quad B = 4.44 \quad C = 1.07$