Code not executed in *Safe preview*

```
using Symbolics
```

Code not executed in *Safe preview*

```
n = 20
```

Code not executed in *Safe preview*

```
@variables x y y1 y2 a[0:n]
```

Code not executed in *Safe preview*

```
y_taylor  = series(a, x)
```

Code not executed in *Safe preview*

```
y1_taylor = expand_derivatives(Differential(x)(y_taylor))
```

Code not executed in *Safe preview*

```
y2_taylor = expand_derivatives(Differential(x)(y1_taylor))
```

Code not executed in *Safe preview*

```
diff_eq1 = 1 + y1^2 - 2*y2*(1 - y) ~ 0
```

Code not executed in *Safe preview*

```
diff_eq2 = substitute(diff_eq1, y => y_taylor)
```

Code not executed in *Safe preview*

```
diff_eq3 = substitute(diff_eq2, y1 => y1_taylor)
```

Code not executed in *Safe preview*

```
diff_eq_taylor = substitute(diff_eq3, y2 => y2_taylor)
```

Code not executed in *Safe preview*

```
diff_eq_taylor1 = taylor(diff_eq_taylor, x, 0:n - 2)
```

Code not executed in *Safe preview*

```
coeff_eq = taylor_coeff(diff_eq_taylor1, x, 0:n - 2)
```

Code not executed in *Safe preview*

```
solutions = Dict{Any, Any}()
```

Code not executed in *Safe preview*

```
solutions[a[0]] = 0  # enforce a0 = 1
```

```
# for k in 2:n
#     eq = coeff_eq[k-1]                    # take equation
#     sol = solve_for(eq, a[k])              # solve for a_k
#     sol_sub = substitute(sol, solutions)    # substitute previous results
#     sol_simplified = simplify(sol_sub)      # clean up
#     solutions[a[k]] = sol_simplified        # save final version
# end
```

Code not executed in *Safe preview*

```
for k in 2:n
    eq = coeff_eq[k-1]                    # equation for coefficient
    sol = solve_for(eq, a[k])             # expression for a[k]

    # only substitute numeric values (like a0), not previous a[j]
    rhs_expr = substitute(sol, Dict(a[0] => solutions[a[0]]))

    # keep as symbolic recurrence (in terms of a1, a2, ...)
    rhs_simplified = simplify(rhs_expr)

    # save recurrence form
    solutions[a[k]] = rhs_simplified
end
```

Code not executed in *Safe preview*

```
solutions
```

Code not executed in *Safe preview*

```
a1_poly = sum((-1)^i * a[i] for i in 0:n)

```

Code not executed in *Safe preview*

```
a1_poly1 = substitute(a1_poly, solutions)
```

Code not executed in *Safe preview*

```
poly_in_a1 = simplify(expand(a1_poly1))
```