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1. $y'' + 3y' + 2y = 0$

$$r^2 + 3r + 2 = 0$$

$$(r+1)(r+2)$$

$$y = c_1 e^{-x} + c_2 e^{-2x}$$

$$y_1 = 6e^{-x} + 62e^{-2x}$$

$$y_2 = 69e^{-x} + 420e^{-2x}$$

$$y_3 = y_1 + y_2 = 75e^{-x} + 482e^{-2x}$$

$$y_3' = -75e^{-x} - 964e^{-2x}$$

$$y_3'' = 75e^{-x} + 1928e^{-2x}$$

$$y_3'' + 3y_3' + 2y_3 = 0$$

$$0 = 75e^{-x} + 1928e^{-2x} - 225e^{-x} - 2892e^{-2x} + 150e^{-x} + 946e^{-2x}$$

$$0 = 0$$

2. $y'(x)^2 - 4y(x) = 0$

$y_1(x) = x^2$ $y_1'(x) = 2x$

$$4x^2 - 4x^2 = 0 \checkmark$$

$y_2(x) = 2x^2$ is not a solution because the diff. eq. is not linear, so that property does not apply

$y_2(x) = 2x^2$ $y_2'(x) = 4x$

$$16x^2 - 8x^2 = 8x^2 \neq 0$$

$$3. \quad a(n) = Aa(n-1) + Ba(n-2)$$

$$x^2 - Ax - B = 0$$

$$A = 1 \quad B = 2$$

$$x^2 - x - 2 = 0$$

$$(x-2)(x+1)$$

$$a_n = C(2^n) + D(-1)^n$$

$$C = 2 \quad D = 1$$

$$a_{n_1} = 2(2^n) + (-1)^n$$

$$C = 1 \quad D = 2$$

$$a_{n_2} = 2^n + 2(-1)^n$$

$$a_{n_3} = a_{n_1} + a_{n_2} = 3(2^n) + 3(-1)^n$$

$$4. \quad a(n) = a(n-1)^2, \quad n \geq 0$$

$$a_1(n) = 2^{2^n}$$

$$a_2(n) = 3^{2^n}$$

$$a_1(1) = 4$$

$$a_2(1) = 9$$

$$a_1(2) = 16$$

$$a_2(2) = 81$$

$$a_1(3) = 256$$

$$a_2(3) = 6561$$

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$$a_3(n) = 2^{2^n} + 3^{2^n}$$

The property does not apply to recurrence eqs

$$a_3(0) = 2 + 3 = 5$$

$$a_3(1) = 4 + 9 = 13$$

$$a_3(2) = 16 + 81 = 97$$

$$a_3(3) = 256 + 6561 = 6817$$

x

5. $\text{resolve}(\{a(n) - 7a(n-1) + 12a(n-2) = 6n - 11, a(0) = 3, a(1) = 9\}, a(n))$
 $3^n + n + 1 + 4^n$

$\text{resolve}(\{a(n) - 4a(n-2) = -3n + 8, a(0) = 2, a(1) = 1\}, a(n))$
 $(-2)^n + 2^n + n$