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**General directions:** *Show all essential work very neatly. Use correct notation when presenting your computations and arguments. Write using complete sentences. Be careful. Remember this: "=" denotes "equals" , "⇒" denotes "implies" , and "⇔" denotes "is equivalent to". Since the answer really consists of all the magic transformations, do not "box" your final results. Communicate. Show me all the magic on the page.*

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**Silly 10 Point Bonus:** What linear homogeneous ODE with constant coefficients has a fundamental set of solutions given by $\{ e^x, e^x\sin(x), e^x\cos(x) \}$ Say where your work is!

If $\{ e^x, e^x\sin(x), e^x\cos(x) \}$ is a fundamental set of solutions to a constant coefficient equation with real coefficients, we can see that the auxiliary equation has as its roots 1, 1 + i, and 1 - i. Consequently, we can rebuild the desired polynomial by a routine multiplication:

$$p(m) = (m-1)(m-(1+i))(m-(1-i)) = \ldots = m^3 - 3m^2 + 4m - 2$$

Ah...The ODE, that's easy now:

$$y''' - 3y'' + 4y' - 2y = 0.$$

Kindly note that this is not the only way in which this problem may be attacked. You could, of course, build a little three by three linear system by substituting into an appropriate differential equation. Solving that linear system would provide the desired coefficients. o.o.