1, Let y (t) be the solution of $y'' + \omega_0 y = \left(\frac{A}{m}\right) \cos[\omega t]$,
with $y(0) = y'(0) = 0$. Assuming that $\omega \neq \omega_0$,
find $\lim_{\omega \to \omega_0} y(t)$. How does this limit compare with the solution of $y'' + \omega_0 y = \left(\frac{A}{m}\right) \cos[\omega_0 t]$,
with $y(0) = y'(0) = 0$

2, Find the general solution of the differential equation of the initial value problem.

$$x^2 y'' - x y' - 2 y = x^3 + 4 \ln[x] \; ; \; y(1) = 9 \, , \; y'(1) = 7$$

3, The initial value problem can be solved in closed form using methods from Chapters 1. Find this solution and expand it in a Maclaurin series. Then find the Maclaurin series solution using methods of section4 .1. The two series should agree.

$$y' + y = 2 \; ; \; y(0) = -1$$

4, Find the recurrence relation and use it to generate the first five terms of the Maclaurin series of the general solution.

$$y' + x y = \cos[x]$$