Example $\frac{dy}{dx} + y = e^x,\ y(0) = 1$		
Step 1	Solve for y_h (the homogeneous solution)	$\frac{dy_h}{dx} + y_h = 0 \to (D+1)y_h = 0 \to$ $D = -1 \to y_h = c_1 e^{-x}$
Step 2	Guess a solution to y_p (based on the right-hand side of the original D.E.)	$y_p = Ae^x$
Step 3	Compare y_h to y_p. If and terms in y_p are the same as the terms in y_h, then multiply the "offending" terms in y_p by the in dependent variable	The terms in y_h and y_p are different, so **do nothing.**
Step 4	Solve for A, B, C, … by substituting y_p into the original D.E.	$\frac{dy_p}{dx} + y_p = Ae^x + Ae^x = e^x \to$ $2Ae^x = e^x \to 2A = 1 \to A = \frac{1}{2} \to$ $y_p = \frac{1}{2}e^x$
Step 5	Combine y_h and y_p, i.e. $y = y_h + y_p$.	$y = c_1 e^{-x} + \frac{1}{2}e^x$
Step 6	Solve of c_1, c_2, c_3 … by appliying initial values	$y(0) = c_1 + \frac{1}{2} = 1 \to c_1 = \frac{1}{2} \to$ $y = \frac{1}{2}e^{-x} + \frac{1}{2}e^x$

Example $\mathbf{y'' + y = \sin(t),\ y(0) = 1,\ y'(0) = 0}$		
Step 1	Solve for y_h (the homogeneous solution)	$y_h'' + y_h = 0 \to (D^2+1)y_h = 0 \to$ $D = \pm i \to \mathbf{y_h = c_1\sin(t) + c_2\cos(t)}$
Step 2	Guess a solution to y_p (based on the right-hand side of the original D.E.)	$\mathbf{y_p = A\sin(t) + B\cos(t)}$
Step 3	Compare y_h to y_p. If and terms in y_p are the same as the terms in y_h, then multiply the "offending" terms in y_p by the in dependent variable	The terms in y_h and y_p are the same, therefore: $\mathbf{y_p = At\sin(t) + Bt\cos(t).}$
Step 4	Solve for A, B, C, … by substituting y_p into the original D.E.	$y_p = At\sin(t) + Bt\cos(t)$ $y_p' = A\sin(t) + At\cos(t) + B\cos(t) - Bt\sin(t)$ $y_p'' = 2A\cos(t) - At\sin(t) - 2B\sin(t) - Bt\cos(t)$ $y_p'' + y_p = 2A\cos(t) - 2B\sin(t) = \sin(t)$ $2A = 0\ and\ -2B = 1 \to A = 0, B = -1/2$ $\mathbf{y_p = -\frac{1}{2}t\cos(t)}$
Step 5	Combine y_h and y_p, i.e. $y = y_h + y_p$.	$\mathbf{y = c_1\sin(t) + c_2\cos(t) - \frac{1}{2}t\cos(t)}$
Step 6	Solve of c_1, c_2, c_3 … by appliying initial values	$y(0) = c_2 = 1 \to$ $y = c_1\sin(t) + \cos(t) - \frac{1}{2}t\cos(t) \to$ $y' = c_1\cos(t) - \sin(t) - \frac{1}{2}\cos(t) - \frac{1}{2}t\sin(t) \to$ $y'(0) = c_1 - \frac{1}{2} -= 0 \to c_1 = \frac{1}{2} \to$ $\mathbf{y = \frac{1}{2}\sin(t) + \cos(t) - \frac{1}{2}t\cos(t)}$