Week 5 summary:

- 2nd order linear ODE's with constant coefficients: $y'' + py' + qy = 0$

  Assume $y(t) = e^{rt}$, plug back in & solve for r.

  Get $e^{rt}(r^2 + pr + q) = 0$.

  3 cases: (i) $r_1 \neq r_2$ real $y(t) = C_1 e^{r_1 t} + C_2 e^{r_2 t}$

  (ii) $r_1 = r_2$ $y(t) = C_1 e^{r_1 t} + C_2 t e^{r_1 t}$

  (iii) $r_{1,2} = a \pm bi$ $y(t) = e^{at}(A \cos bt + B \sin bt)$

- Inhomogeneous equations: $y'' + py' + qy = f(t)$, $f(t) \neq 0$.

  Guess: $y_p(t)$ "has the same form" as $f(t)$.

  This is the "method of undetermined coefficients."

$f(t)$	$y_p(t)$
e^{rt}	$a e^{rt}$
$\cos wt$ or $\sin wt$	$a \cos wt + b \sin wt$
degree-n polynomial	degree-n polynomial
$e^{rt} \cos wt$ or $e^{rt} \sin wt$	$e^{rt}(a \cos wt + b \sin wt)$
linear combination of above functions	linear combination of above functions.