Second-Order Circuit

- The differential equation is
  \[
  \frac{d^2}{dt^2} v(t) + 7 \frac{d}{dt} v(t) + 10 v(t) = 180
  \]

- The initial conditions are:
  \[
  v(0^+) = 30 \text{ V} \\
  \left. \frac{d}{dt} v(t) \right|_{t=0^+} = -20
  \]

- The steady-state solution (forced response) is:
  \[
  v(\infty) = 18 \text{ V}
  \]

- The complete solution is:
  \[
  v(t) = \frac{40}{3} e^{-2t} - \frac{4}{3} e^{-5t} + 18 \text{ V}
  \]

- Plot:

```matlab
% MATLAB code:
t = linspace(0, 5, 1000);
v = (40/3)*exp(-2*t) - (4/3)*exp(-5*t) + 18;
plot(t, v, 'k-', 'LineWidth', 2);
grid on
xlabel('t (sec)');
ylabel('v(t) (V)');
```