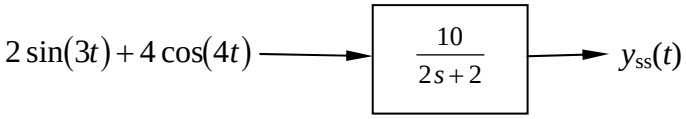
# Lesson 21

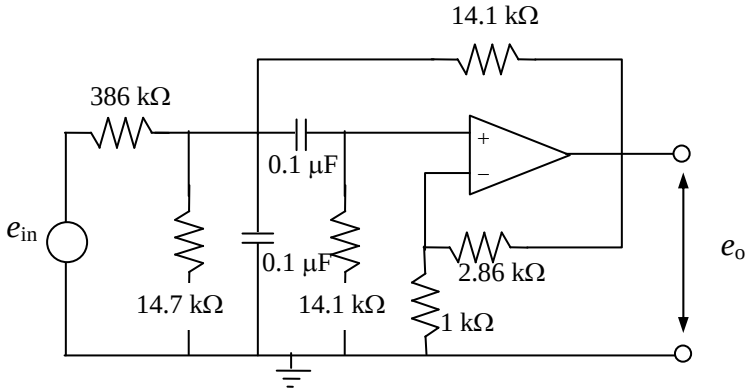
**Problem 21.1**

For the system and input function shown, use the transfer-function approach to determine the steady state response, $y_{ss}(t)$.




**Problem 21.2**

Sallen and Key developed many circuits based on positive feedback including low-pass, high-pass and band-pass filters. For the second-order band-pass filter shown below:




In a previous HW problem you showed that the transfer function is approximately

$$TF(s) = \frac{E_o}{E_{in}}(s) \approx \frac{100s}{s^2 + 100s + (1000)^2}.$$

Using this transfer function, determine the steady state response for:

i) $e_{in} = 10\cos(500t)$. Using Matlab, plot $e_{in}$ and $e_o$ on the same graph.
ii) $e_{in} = 10\cos(1000t)$. Using Matlab, plot $e_{in}$ and $e_o$ on the same graph.
iii) $e_{in} = 10\cos(1500t)$. Using Matlab, plot $e_{in}$ and $e_o$ on the same graph.

(Use subplot commands to put all three graphs on the same page.)

Make observations on your results.