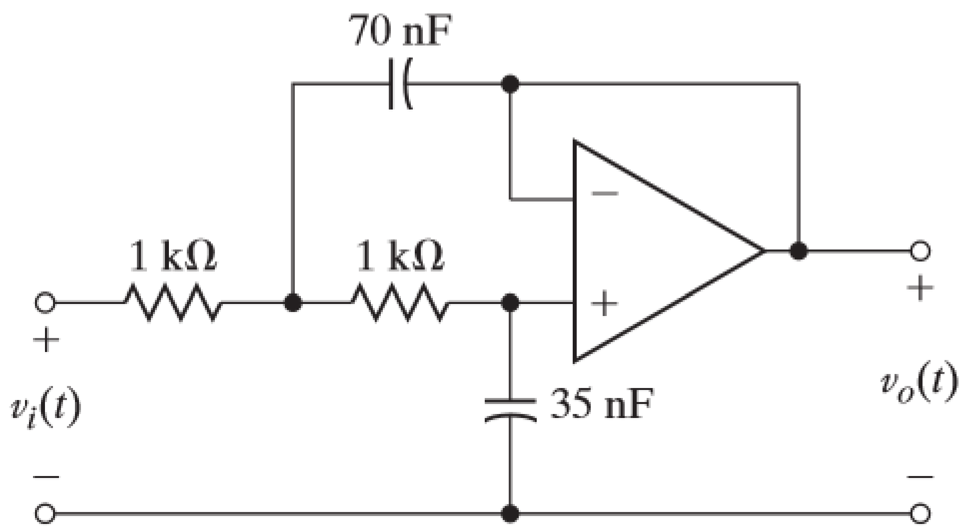
EE103_Fall2017 HW#8

November 20, 2017

1. (a). Find $Vo(\omega)/Vi(\omega) = H(\omega)$ for the filter circuit below
   (b). Find (b).



(b). Find the 3dB frequency and the bandwidth.

2.

6.25. Consider the system shown in Figure P6.25.

(a) Give the constraints on $x(t)$ and T such that $x(t)$ can be reconstructed (approximately) from $x_p(t)$.

(b) Give the frequency response $H(\omega)$ such that $y(t) = x(t)$, provided that $x(t)$ and T satisfy the constraints in part (a).

(c) Let $x(t) = \cos(200\pi t)$. If $T = 0.004$ s, list all frequency components of $x_p(t)$ less than 700 Hz.

(d) Let $x(t) = \cos(2\pi f_x t)$. Find a value of $f_x \neq 100$ Hz such that the same frequencies appear in $x_p(t)$ as in Part (c).

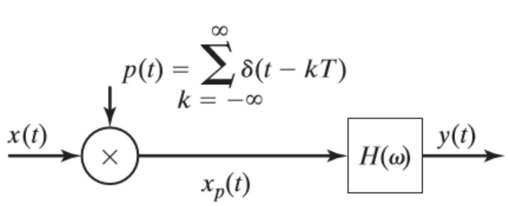


Figure P6.25

3.

7.4. Consider the waveform $f(t)$ in Figure P7.4. This waveform is one cycle of a sinusoid for $0 \leqq t \leqq \pi$ s and is zero elsewhere.

(a) Write a mathematical expression for $f(t)$.

(b) Find the Laplace transform for this waveform, using (7.4), and the table of integrals in Appendix A.

(c) Use the real-shifting property to verify the results of part (b).

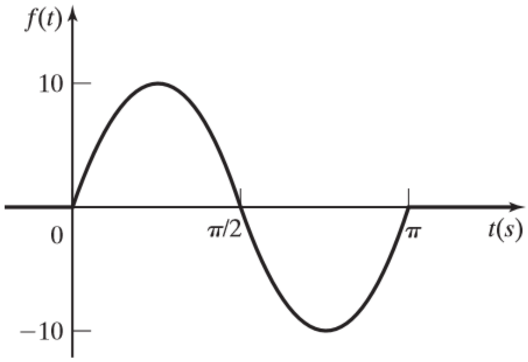


Figure P7.4

$$\mathscr{L}[f(t)] = F(s) = \int_0^{\infty} f(t)e^{-st}\,dt, \qquad (7.4)$$

A INTEGRALS AND TRIGONOMETRIC IDENTITIES

INTEGRALS

1. $\int u\,dv = uv - \int v\,du$

2. $\int e^u\,du = e^u + C$

3. $\int \cos u\,du = \sin u + C$

4. $\int \sin u\,du = -\cos u + C$

5. $\int ue^u\,du = e^u(u - 1) + C$

6. $\int e^{au} \cos bu\,du = \dfrac{e^{au}(a \cos bu + b \sin bu)}{a^2 + b^2} + C$

7. $\int e^{au} \sin bu\,du = \dfrac{e^{au}(a \sin bu - b \cos bu)}{a^2 + b^2} + C$

8. $\int u \cos u\,du = \cos u + u \sin u + C$

9. $\int u \sin u\,du = \sin u - u \cos u + C$