Answers

1. Taking the Fourier transform of the differential equation and using the property

$$\dot{x}(t) \leftrightarrow (j\omega)X(j\omega),$$

we obtain:

$$\left[m(j\omega)^2 + b(j\omega) + k\right]X(j\omega) = \left[b(j\omega) + k\right]Y(j\omega)$$

$$H(j\omega) = \frac{Y(j\omega)}{X(j\omega)} = \frac{b(j\omega)+k}{m(j\omega)^2 + b(j\omega) + k}.$$

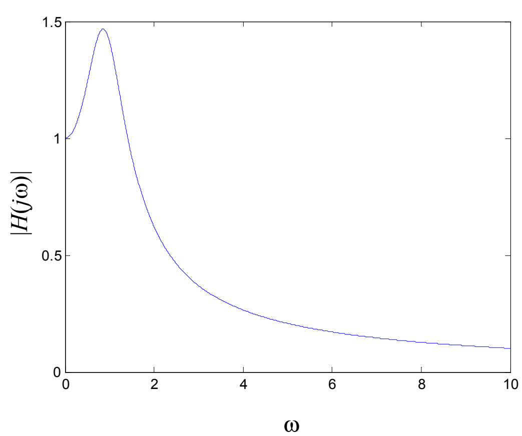
2. Setting $m = b = k = 1$:

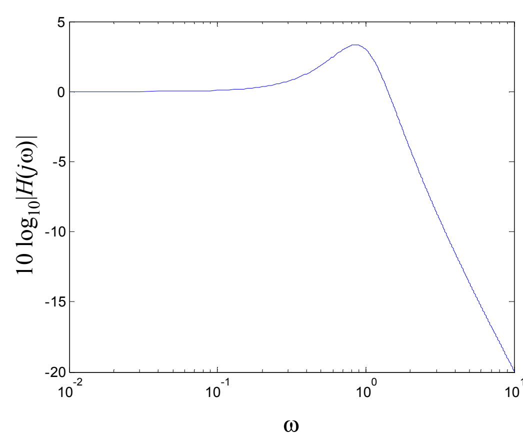
$$H(j\omega) = \frac{j\omega + 1}{j\omega + 1 - \omega^2}$$

$$\left|H(j\omega)\right| = \sqrt{\frac{\omega^2 + 1}{\omega^2 + \left(1 - \omega^2\right)^2}}$$

We evaluate $\left|H(j\omega)\right|$ for several values of ω:

ω	$\left\|H(j\omega)\right\|$
0	1
1	$\sqrt{2}$
∞	0





3. Let $q(t)$ denote one period of $x(t)$. Note that $q(t) = h\Lambda\left(\frac{t}{T/4}\right)$, and use the Fourier transform pair