ESERCIZIO 1: RISPOSTA AL GRADINO UNITARIO sca(t) DI UN SISTEMA DINAMICO LINEARE DEL SECONDO ORDINE

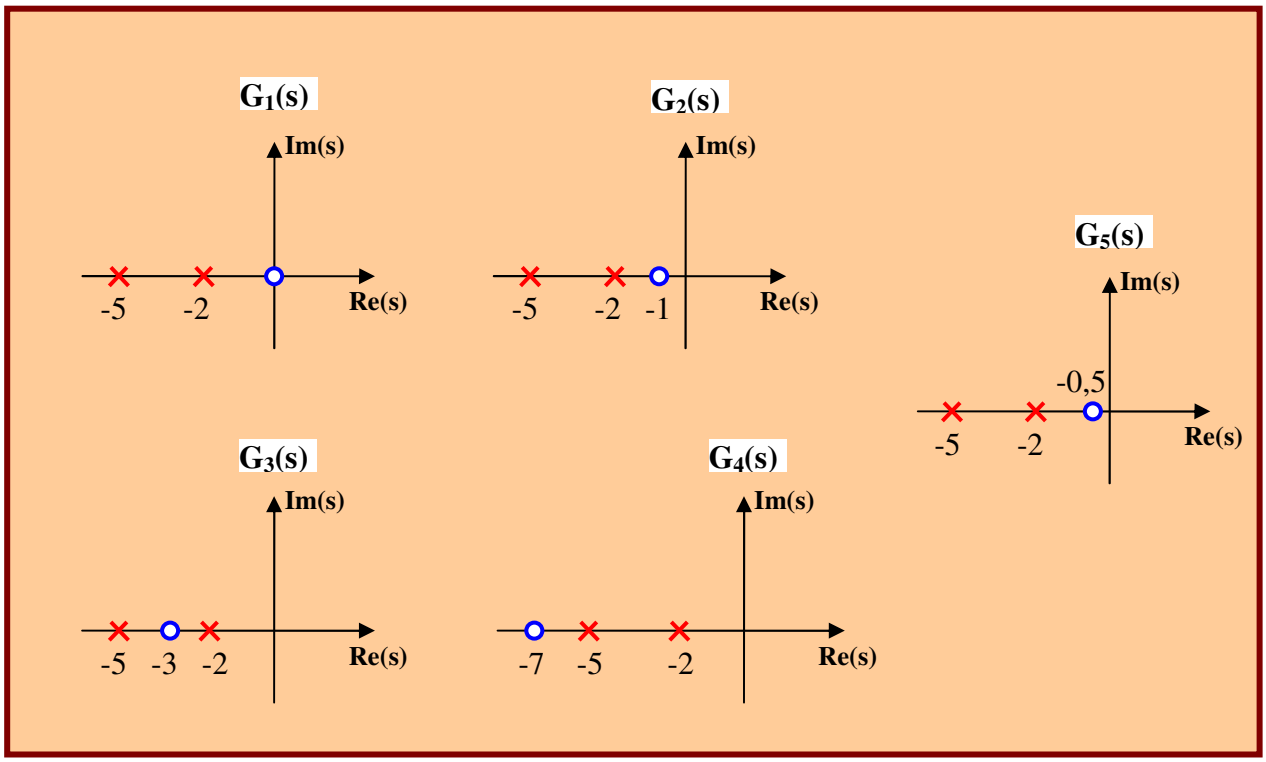
Sono assegnate le Funzioni di Trasferimento dei seguenti sistemi del 2°ordine con ξ>1:

$$G_1(s)=\frac{5s}{s^2+7s+10} \qquad G_2(s)=\frac{5\cdot(1+s)}{s^2+7s+10} \qquad G_3(s)=\frac{5}{3}\cdot\frac{(s+3)}{s^2+7s+10}$$

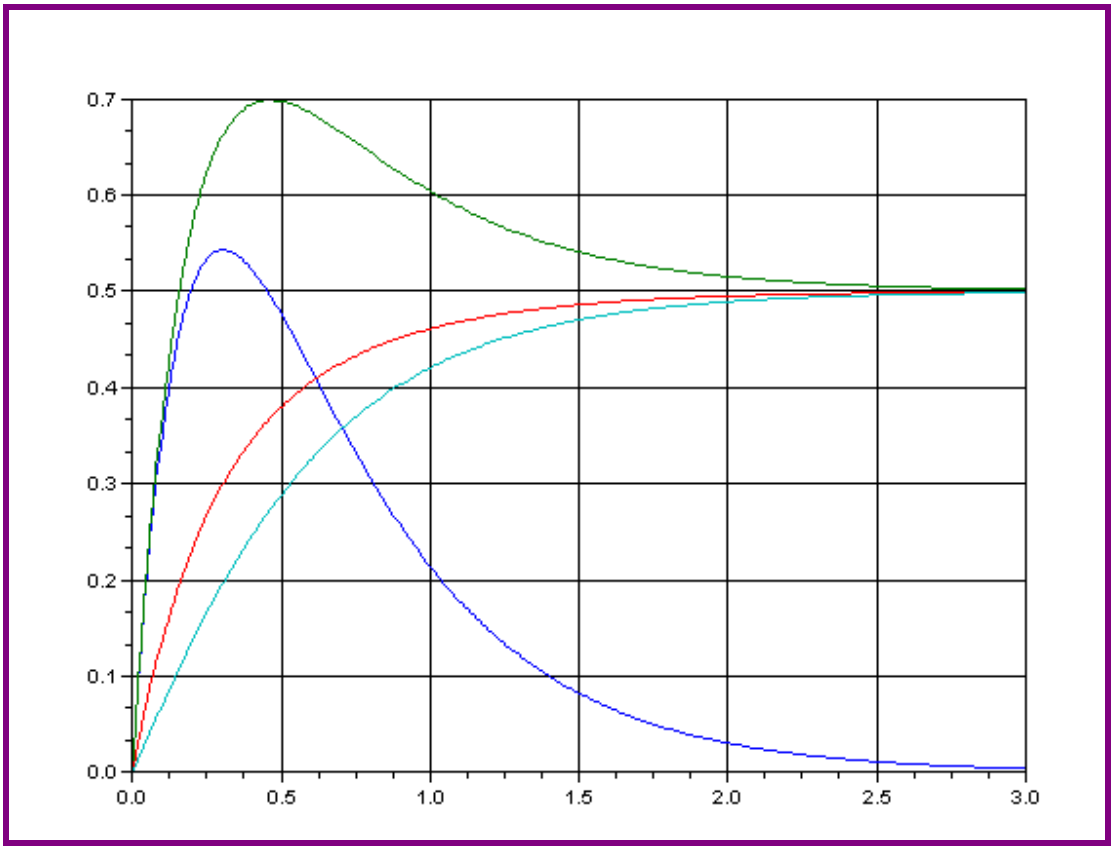
$$G_4(s)=\frac{5}{7}\cdot\frac{(s+7)}{s^2+7s+10} \qquad G_5(s)=\frac{10\cdot(s+0{,}5)}{s^2+7s+10}$$

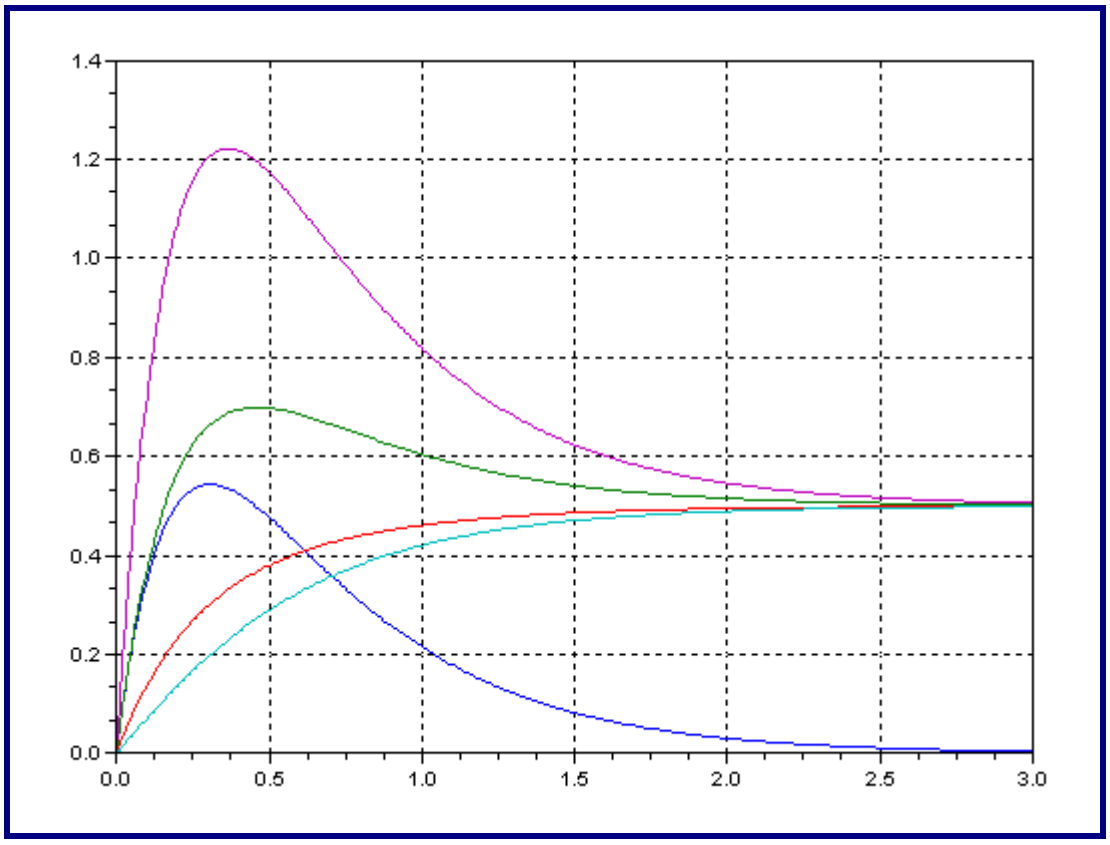
Determinare le caratteristiche della risposta al gradino unitario.

```
-->den=poly([10 7 1],'s','c');
-->num1=poly([0 5],'s','c');
-->num2=poly([5 5],'s','c');
-->num3=poly([15 5],'s','c');
-->num4=poly([35 5],'s','c');
-->num5=poly([5 10],'s','c');
-->giesse1=syslin('c',num1,den);
-->giesse2=syslin('c',num2,den);
-->giesse3=syslin('c',num3,3*den);
-->giesse4=syslin('c',num4,7*den);
-->giesse5=syslin('c',num5,den);
-->t=0:0.01:3;
-->y1=csim('step',t,giesse1);
-->y2=csim('step',t,giesse2);
-->y3=csim('step',t,giesse3);
-->y4=csim('step',t,giesse4);
-->y5=csim('step',t,giesse5);
-->plot(t,y1,t,y2,t,y3,t,y4,t,y5),xgrid
```



$$\omega_n^2 = 10 \Rightarrow \omega_n = \sqrt{10}\ rad/\sec \quad 2\xi\omega_n = 7 \Rightarrow \xi = \frac{7}{2\omega_n} = \frac{7}{2\sqrt{10}} > 1$$



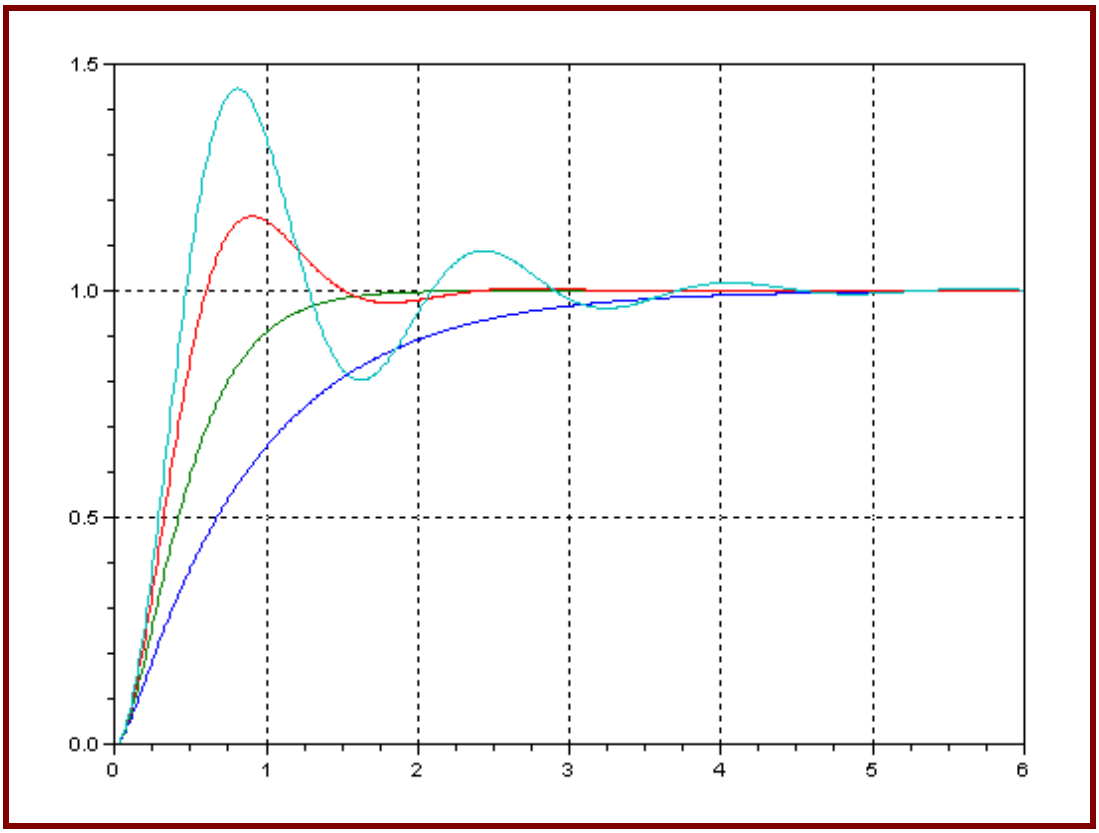


Sono assegnate le Funzioni di Trasferimento dei seguenti sistemi del 2°ordine:

$$G_1(s) = \frac{16}{s^2 + 15s + 16} \qquad G_2(s) = \frac{16}{s^2 + 8s + 16} \qquad G_3(s) = \frac{16}{s^2 + 4s + 16} \qquad G_4(s) = \frac{16}{s^2 + 2s + 16}$$

Determinare le caratteristiche della risposta al gradino unitario.

```
-->num=16;
-->den1=poly([16 15 1],'s','c');
-->den2=poly([16 8 1],'s','c');
-->den3=poly([16 4 1],'s','c');
-->den4=poly([16 2 1],'s','c');
-->giesse1=syslin('c',num,den1);
-->giesse2=syslin('c',num,den2);
-->giesse3=syslin('c',num,den3);
-->giesse4=syslin('c',num,den4);
-->t=0:0.01:6;
-->y1=csim('step',t,giesse1);
-->y2=csim('step',t,giesse2);
-->y3=csim('step',t,giesse3);
-->y4=csim('step',t,giesse4);
-->plot(t,y1,t,y2,t,y3,t,y4,),xgrid
```



$$\omega_n^2 = 16 \Rightarrow \omega_n = \sqrt{16} = 4 rad/\sec \quad 2\xi_1\omega_n = 15 \Rightarrow \xi_1 = \frac{15}{2\omega_n} = \frac{15}{2\cdot 4} = 1{,}875$$

$$\omega_n^2 = 16 \Rightarrow \omega_n = \sqrt{16} = 4 rad/\sec \quad 2\xi_2\omega_n = 8 \Rightarrow \xi_2 = \frac{8}{2\omega_n} = \frac{8}{2\cdot 4} = 1$$

$$\omega_n^2 = 16 \Rightarrow \omega_n = \sqrt{16} = 4 rad/\sec \quad 2\xi_3\omega_n = 4 \Rightarrow \xi_3 = \frac{4}{2\omega_n} = \frac{4}{2\cdot 4} = 0{,}5$$

$$\omega_n^2 = 16 \Rightarrow \omega_n = \sqrt{16} = 4 rad/\sec \quad 2\xi_3\omega_n = 2 \Rightarrow \xi_4 = \frac{2}{2\omega_n} = \frac{2}{2\cdot 4} = 0{,}25$$