1

```
foo=[13+2*j,-5-3*j,-2.4+3.6*j];
magnitudes=abs(foo)
```

```
magnitudes = 1×3
   13.1529    5.8310    4.3267
```

```
phases=angle(foo)*180/pi
```

```
phases = 1×3
    8.7462 -149.0362  123.6901
```

2a

```
num=[2.4];
den=[0.6, 8, 36];
G=tf(num,den);
w=20;
[abs,mag,phase]=bode(G w)
```

```
mag = 0.0093
phase = -141.8924
```

```
phase
```

```
phase = -141.8924
```

```
newamp=mag*30.2
```

```
newamp = 0.2796
```

So final answer, **0.2796cos(20t-141.9)**

2b

```
mag2db(mag)
```

```
ans = -40.6705
```

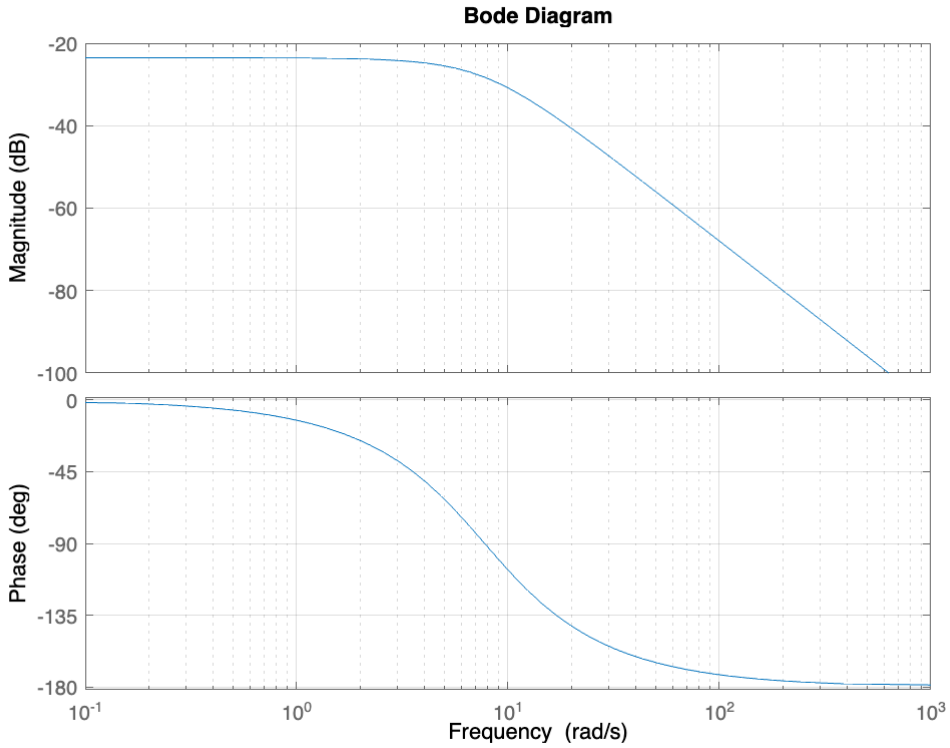
2c

```
phi=phase*pi/180;
timeshift=abs(phi/w)
```

```
timeshift = 0.1238
```

2d

```
bode(G)
grid on
```



3a

```
tau=0.2;
wc=1/tau
```

```
wc = 5
```

3b

```
num=[4];
den=[0.2 1];
G=tf(num,den);
bw=bandwidth(G)
```

```
bw = 4.9881
```

4a

```
num=[1];
den=[0.6 3.4 80];
G=tf(num,den);
w=8;
[mag,phase]=bode(G,w)
```

```
mag = 0.0201
phase = -33.1785
```

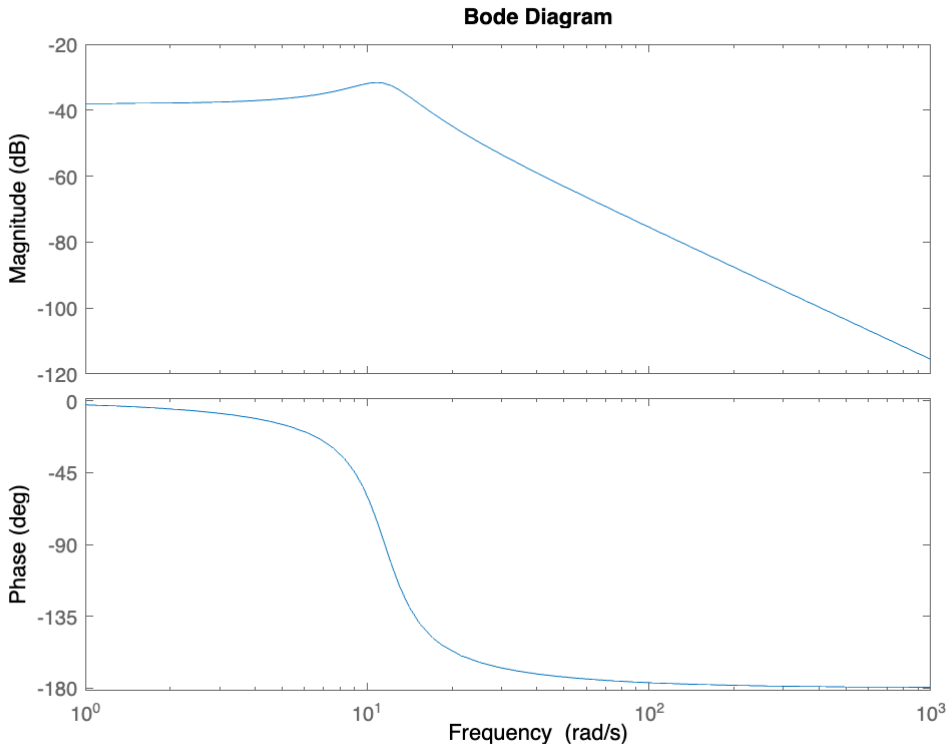
```
newamp=mag*2
```

```
newamp = 0.0402
```

Output is 0.0402sin(8t-33.2)

4b

```
bode(G)
```




```
wn=sqrt(80/0.6);
zeta=3.4/(2*wn*0.6);
wr=wn*sqrt(1-2*(zeta^2))
```

```
wr = 10.8295
```