

Reference: D:\Users\Bernhard\Lib\MathCAD\Default\defaults.mcd

247 Homework 1

Given

$$\omega_o = \sqrt{\frac{2}{R_1^2 \cdot C_1^2}}$$

$$Q = \frac{\omega_o}{\frac{3}{R_1 \cdot C_1} + \frac{1 - \mu}{R_1 \cdot C_1}}$$

$$\text{Find}(R_1, \mu) \rightarrow \begin{bmatrix} \frac{\sqrt{2}}{(\omega_o \cdot C_1)} & \frac{-\sqrt{2}}{(\omega_o \cdot C_1)} \\ \frac{(4 \cdot Q - \sqrt{2})}{Q} & \frac{(4 \cdot Q + \sqrt{2})}{Q} \end{bmatrix}$$

$$\omega_{o1} := 6.7129 \times 10^6 \cdot \text{Hz}$$

$$Q_1 := 7.0535$$

$$\omega_{o2} := 5.8221 \times 10^6 \cdot \text{Hz}$$

$$Q_2 := 7.0535$$

$$C_1 := 1 \text{ pF}$$

$$C_2 := 1 \text{ pF}$$

$$R_1 := \frac{\sqrt{2}}{(C_1 \cdot \omega_{o1})} \quad R_1 = 210.671 \text{ k}\Omega$$

$$\mu_1 := \frac{-(-4 \cdot Q_1 + \sqrt{2})}{Q_1} \quad \mu_1 = 3.8$$

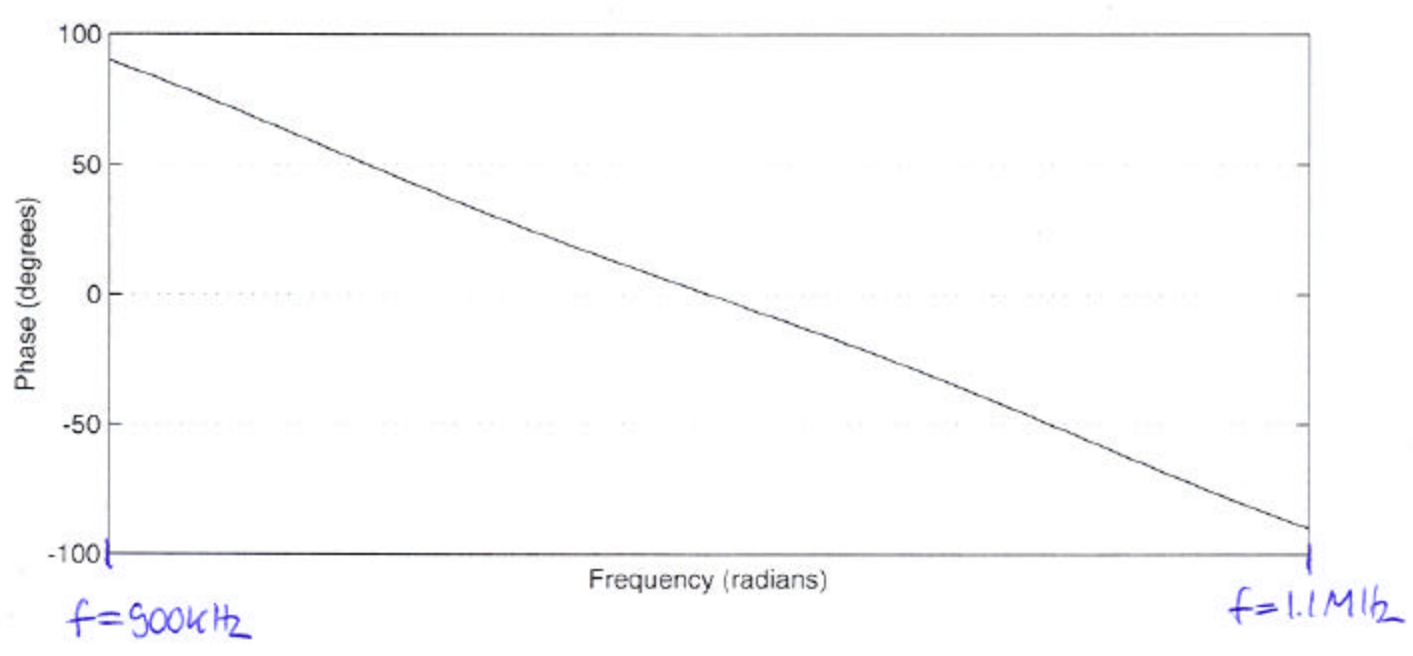
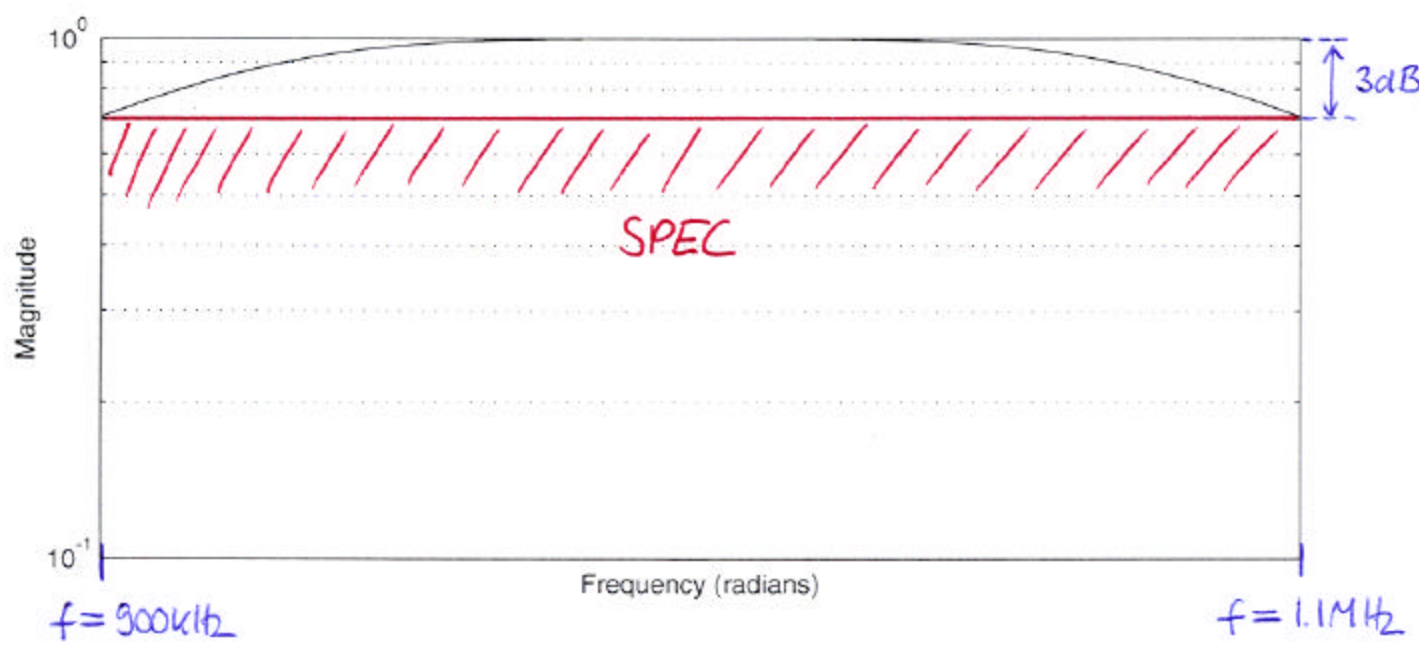
$$G_1 := \frac{\mu_1}{4 - \mu_1} \quad G_1 = 18.95$$

$$R_2 := \frac{\sqrt{2}}{(C_2 \cdot \omega_{o2})} \quad R_2 = 242.904 \text{ k}\Omega$$

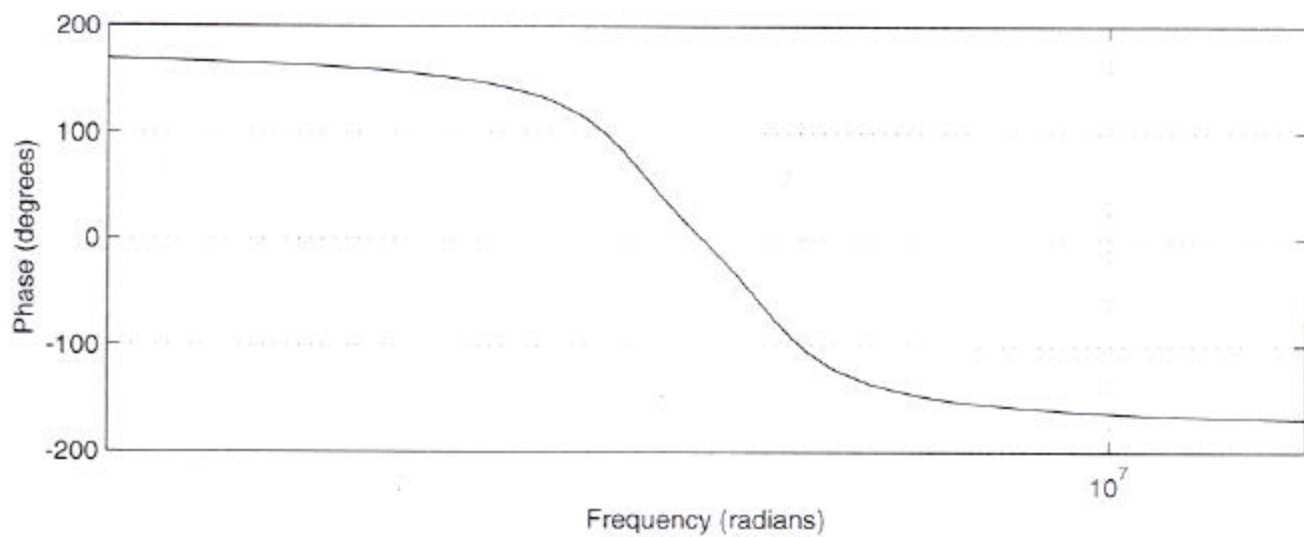
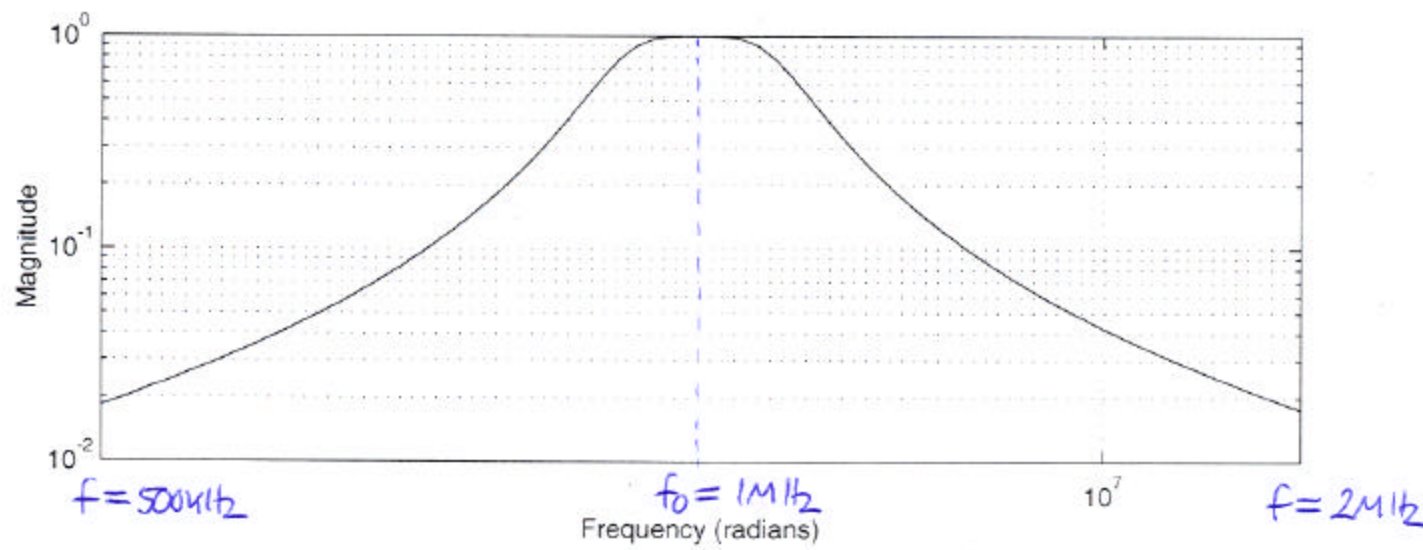
$$\mu_2 := \frac{-(-4 \cdot Q_2 + \sqrt{2})}{Q_2} \quad \mu_2 = 3.8$$

$$G_2 := \frac{\mu_2}{4 - \mu_2} \quad G_2 = 18.95$$

Matlab Passband Plot



Matlab Plot (Zoom Out)



Spectre Input

* EE247 Homework 1
* Spectre Input
* Boris Murmann

***** Circuit Description *****

```
simulator lang=spectre
vin      (vi 0) vsource mag=1
biquad1 (vi vo1) skbp res=210.67k cap=1p k=3.7995
biquad2 (vo1 vo) skbp res=242.90k cap=1p k=3.7995

subckt skbp (vi vo)
  parameters cap res k
  r1 (vi 1) resistor r=res
  r2 (vo 1) resistor r=res
  r3 (2 0) resistor r=res
  c1 (1 0) capacitor c=cap
  c2 (1 2) capacitor c=cap
  k1 (vo 0 2 0) vcvs gain=k
ends skbp
```

***** Control Statements *****

```
SimOptions options
+ rawfmt= psfbin
+ gmin= 1E-12
+ reltol= 1E-03
+ vabstol= 1E-06
+ iabstol= 1E-12
+ temp= 27
```

```
ACsweep ac start=100k stop=10M dec=1000
```

Spechre Output

*q3 := DATA("vo" "ACSwweep-ac" "/home/bisc/b/boser/bmurmman/ee247/hw")

$\uparrow \frac{V_o}{V_i}$

178.65

126.3

$\downarrow -3dB$

()

10²

10¹

SPEC

$f \rightarrow$

10¹

800K

900K

freq (Hz)

1.0M

1.2M

Spechre Output (Zoom out)

q3 : DATA("vo" "AC Sweep-ac" "/home/bisc/b/boser/bmurmann/ee247/hw"

