

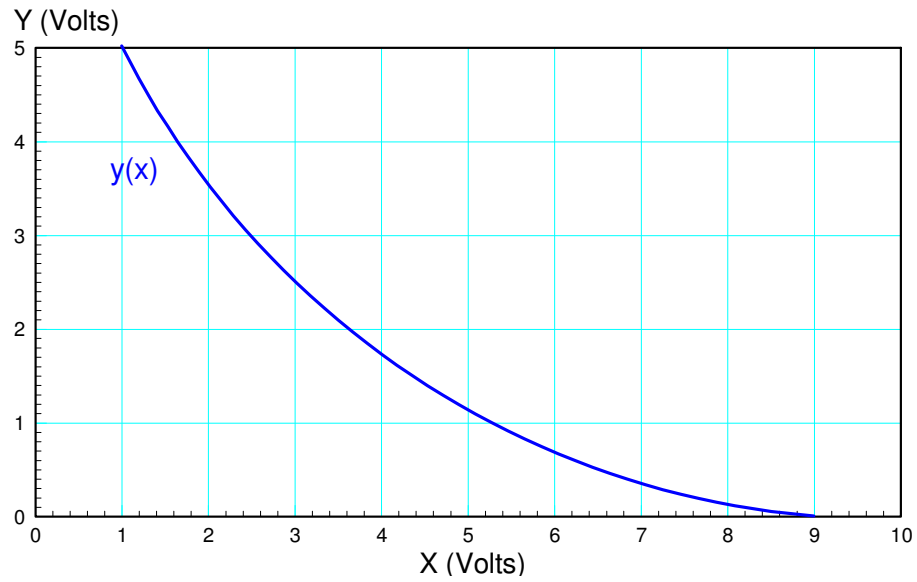
# ECE 321 - Quiz #3 - Name \_\_\_\_\_

Calibration, Active Filters, Poles & Zeros. Due midnight, April 22, 2020

Calculators, Matlab, tarot cards permitted. Just not someone else.

1) Calibration: Given  $y(x)$  shown below, determine the following:

Straight-line approximation for $y = f(x)$	calibration function $y = ax + b$	actual $y$ when $x=4$	estimated $y$ when $x=4$
show on graph			



2) Calibration: A thermistor has the following resistance vs. temperature

degrees C (T)	0C	10C
Ohms (x)	4695.4 Ohms	2832.4 Ohms

2a) Use endpoint calibration to determine the resistance vs. temperature between 0C and 10C in the form of

$$T = ax + b \quad x = \text{resistance in Ohms}$$

2b) From your curve fit, determine the temperature if the resistance is R ohms where

- $R = 1000 + 100 * (\text{your birth month}) + (\text{birth date})$ . May 14th gives  $R = 1514$  Ohms.

a	b	R $1000 + 100 * \text{mo} + \text{day}$	temperature when $x = R$

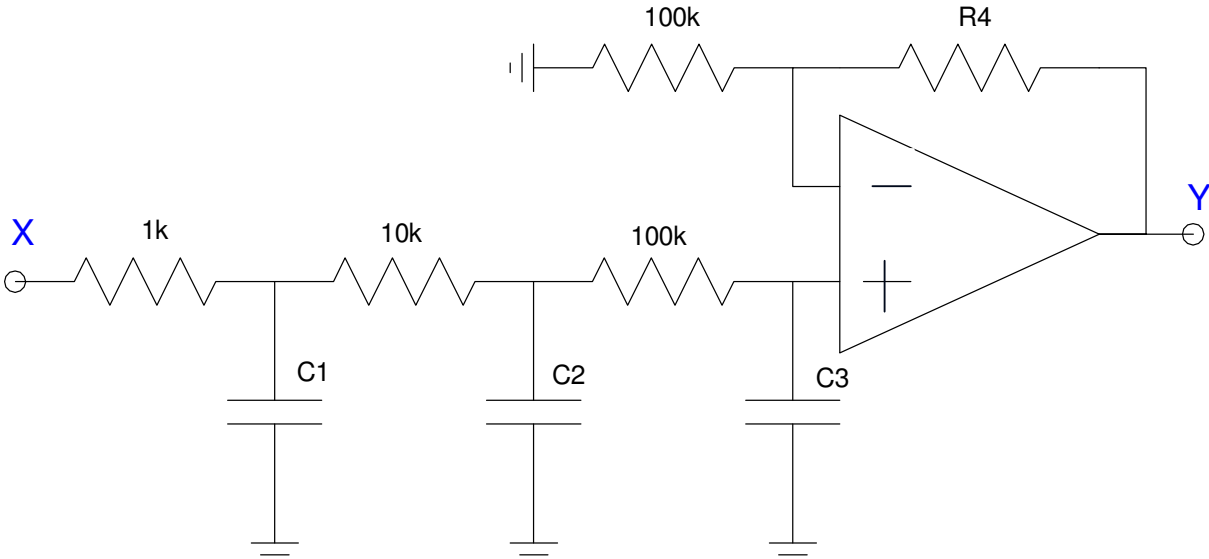
3) Active Filters. Real Poles. Find R and C to implement

$$Y = \left( \frac{10,000}{(s+10)(s+m)(s+d)} \right) X$$

where

- m is your birth month (1..12), and
- d is your birth date (1..31)

m birth month	d birth day	C1	C2	C3	R4



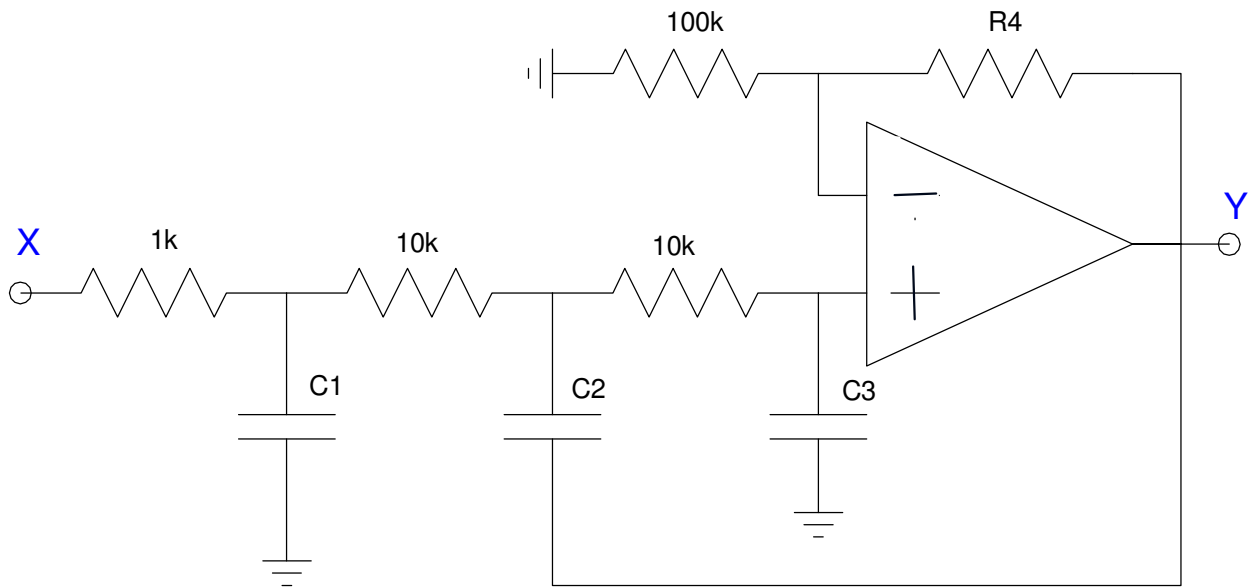
4) Active Filters: Complex Poles: Find R and C to implement

$$Y = \left( \frac{10,000}{(s+10)(s+m+jd)(s+m-jd)} \right) X$$

where

- m is your birth month (1..12), and
- d is your birth date (1..31)

m	d	C1	C2	C3	R4



5) Filters: Assume X and Y are related by the transfer function

$$Y = \left( \frac{100}{(s+m)(s+d)} \right) X$$

where

- m is your birth month (1..12) and
- d is your birth day (1..31).

a) What is the differential equation relating x and y?

b) Determine y(t) assuming

$$x(t) = 3 + 4 \cos(5t) + 6 \sin(5t)$$

m	d	diffy eq	y(t)

6) Determine the poles of a filter with the following gain vs. frequency (Bode) plot.

pole 1	pole 2

