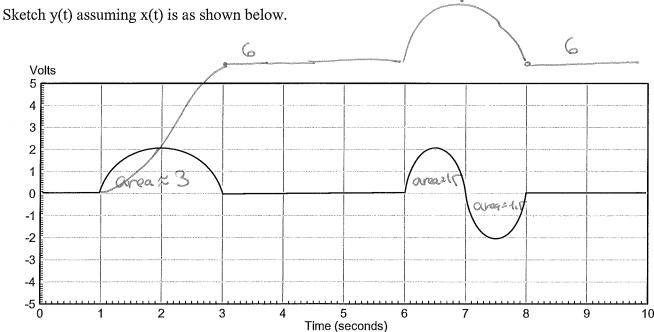
1a) An integrator circuit has the following transfer funcion:

 $Y = \left(\frac{2}{s}\right)X$

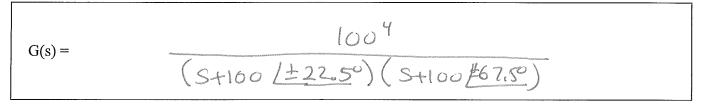


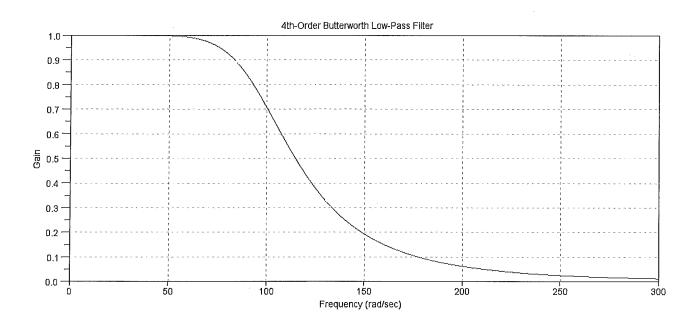
1b) A differentiator circuit has the following transfer function:

$$Y = (2s)X$$

Sketch y(t) assuming x(t) is as shown below. Volts slupe=4 3 2 0 -1 Slupe = 4 -2 -3 -4 3/ 2 5 10 Time (seconds)

- 2) Give the transfer function for a 4th-order Butterworth filter with
 - · A DC gain of one and
 - A corner at 100 rad/sec



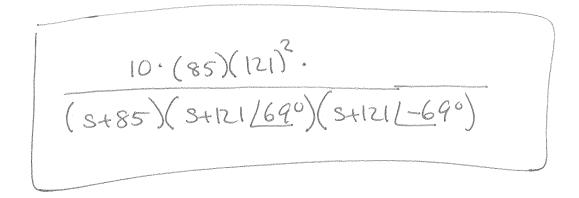


3) The transfer function for a 3rd-order Chebychev filter with a corner at 1 rad/sec is

$$Y = \left(\frac{\alpha}{(s+0.85)(s+1.21 \angle 69^{0})(s+1.21 \angle -69^{0})}\right)X = \left(\frac{\alpha}{(s+0.85)(s^{2}+0.86s+1.46)}\right)X$$

Give the transfer function for a 3rd-order Chebychev filter with

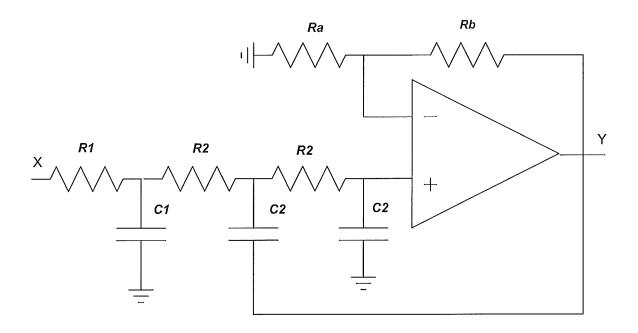
- · A corner at 100 rad/sec and
- · A DC gain of 10



4) Determine R and C to implement the following Chebychev filter:

$$Y = \left(\frac{\alpha}{(s+170)(s+206\angle \pm 69^{0})}\right)X = \left(\frac{\alpha}{(s+170)(s^{2}+172s+206^{2})}\right)X$$

R1	C1	R2	C2	Ra	Rb
5882	LUF	4854	ul	100K	116,5K



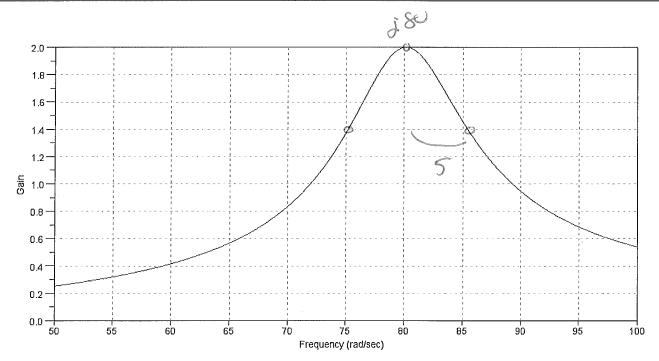
$$\left(\frac{\frac{1}{R_1C_1}}{s+1/R_1C_1}\right) \qquad \left(\frac{k\left(\frac{1}{R_2C_2}\right)^2}{s^2+\left(\frac{3-k}{R_2C_2}\right)s+\left(\frac{1}{R_2C_2}\right)^2}\right) \qquad k=1+\frac{R_b}{R_a}$$

$$(3-k)(206) = 172$$

 $3-k = .035$
 $k = 2.165$
 $k_{2} = 2.165$

5) Give the transfer function for a filter with the following gain vs. frequency

$$G(s) = \frac{2 \cdot 800.39 = 1600.78}{(3+5+j80)(3+5-j80)}$$



Bonus! One of the all-time great guest stars in Godzilla movies was Biollante - a cross between three creatures. What where these three? (circle three)

