EE360D

Friday Sept. 10th, 2021

Linear Difference Eqns.

$$\frac{d}{dt}\left[u(t-3)\right]_{u(0)}^{t=3}$$

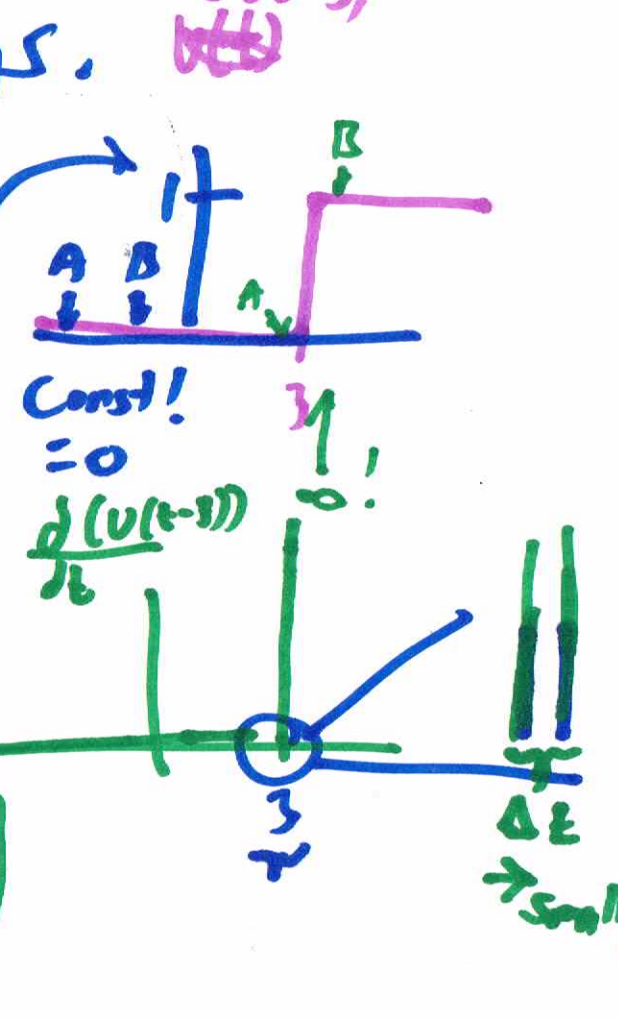
$$\int \frac{d(u(t-3))}{dt}$$

$$\frac{d\,\delta(3t)}{dt}$$

$$f(t) = \left[(t)\right]\frac{d\,\delta(0)}{dt} \rightarrow \frac{d}{dt}\left[t\right]_{t=0}$$

$$\delta(t=0) = \infty$$

$$\delta[n=0] = 1$$



Quiz #3 EE 360 Fall 2021 Name:_____

Attempt and grade yourself with a pen

Show your work for credit and place boxes around your answers.

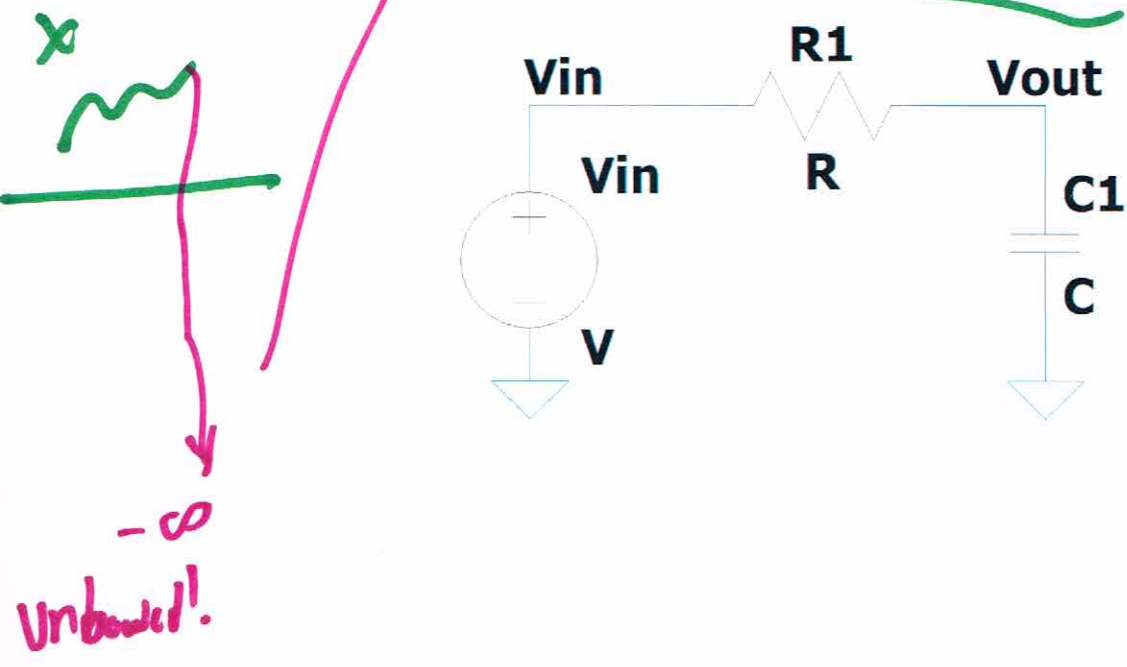
1. Define (in written English):

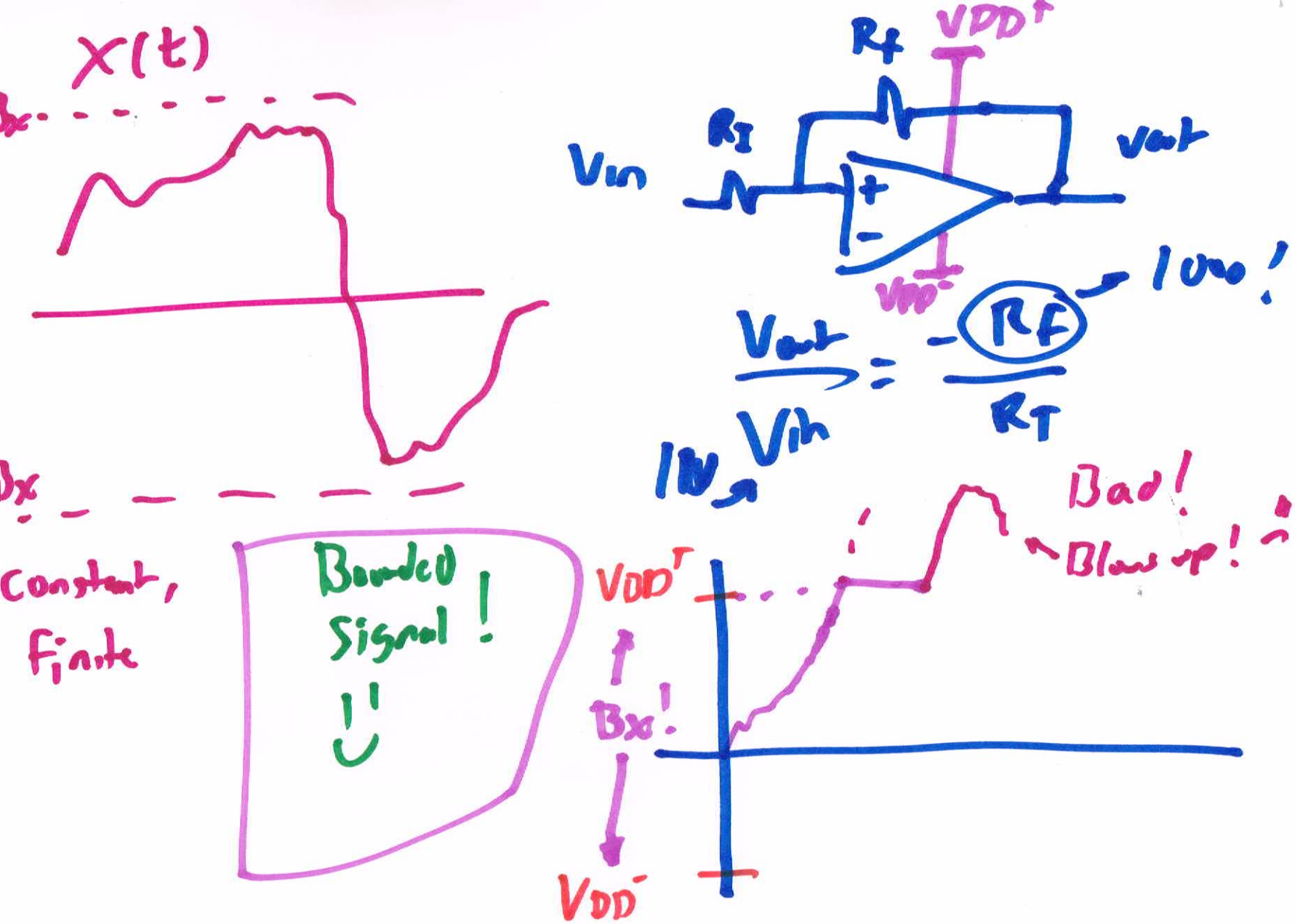
- A bounded signal

A signal, x, is said to be bounded if there exists a finite positive Real number, Bx such that, $|x| \leq B_x < \infty$.

finite!

2. Determine a difference equation for the following circuit. Hint: $I_C(t) = C \cdot \frac{dV_{out}(t)}{dt}$




X(t)
Bx
Bx
Constant, Finite
Bounded Signal !
!!
RF
RI
VDD+
VDD-
Vin
Vout
+
-
Vout = - (RF/RI) Vin
Inv !
Bad ! Blows up !
VDD+
Bx !
VDD-

Schwartz Inequality

Schwarz !

$$|y(t)| = |x(t)|$$

$$= \left| \int (t)\, dt \right| \leq \int |t|\, dt$$

Value

Sch

1st $\leq$ 2nd

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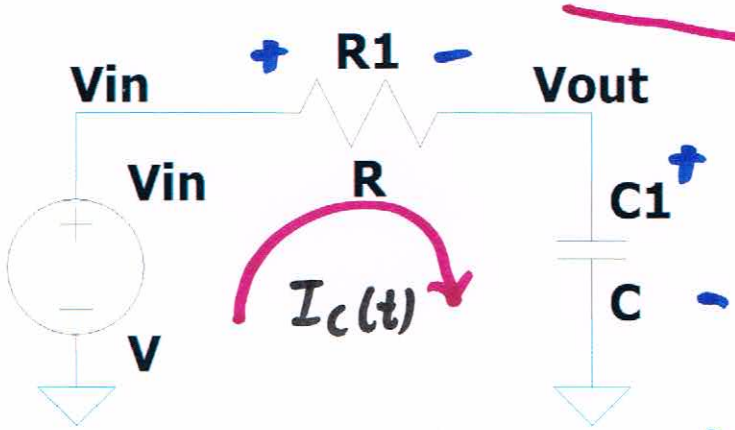


$$Vin(t) - I_C(t)R = Vout(t)$$

Linear Difference eqn!

$$Vin(t) - RC\frac{dVout(t)}{dt} = Vout(t)$$

$$RC\frac{dVout(t)}{dt} + Vout(t) = Vin(t)$$

5)

$$RC\frac{dV_{out}(t)}{dt} + V_{out}(t) = V_{in}(t)$$

$$x(t) = V_{in}(t)$$

$$y(t) = V_{out}$$

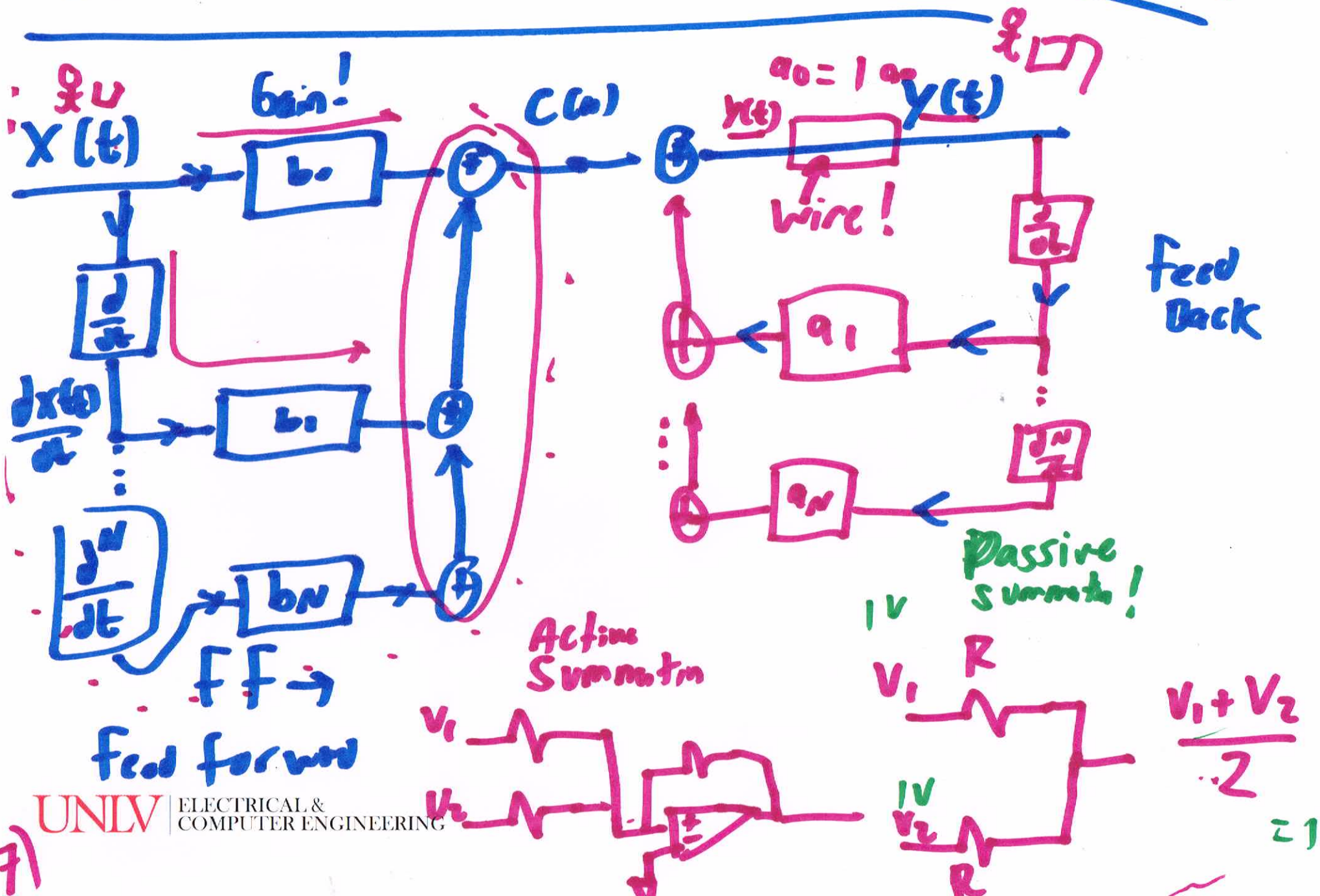
$$\frac{dV_{out}(t)}{dt} + \frac{1}{RC}V_{out}(t) = \frac{1}{RC}V_{in}(t)$$

$$1\frac{dy(t)}{dt} + a_0\frac{1}{RC}y(t) = b_0\frac{1}{RC}x(t)$$

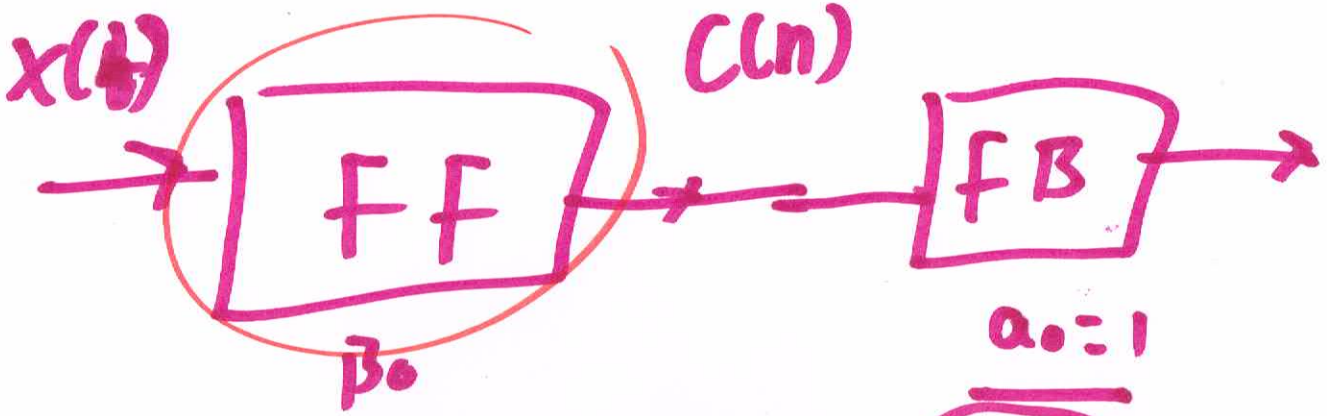
General Diff eqn

$$a_1\frac{d^1y(t)}{dt} + a_0 y(t) = b_0 x(t)$$

Direct form I Block diagram Analog!



DFI



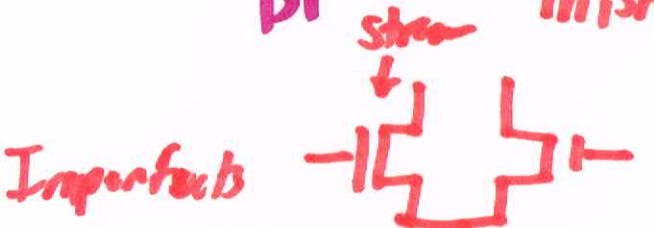
$a_0 = 1$

a_1

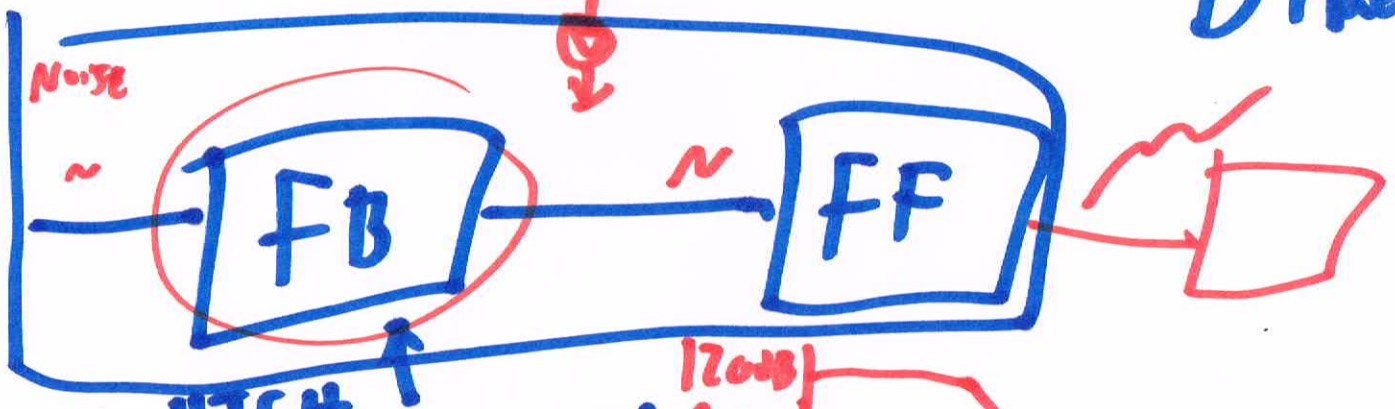
a_2

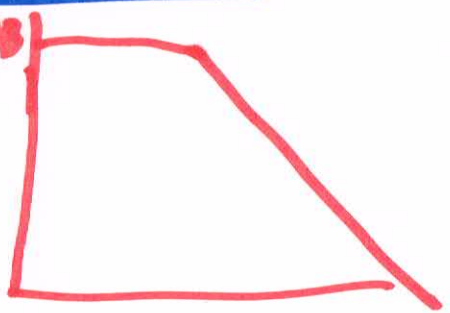
Mismatch

Poles! → Laplace Transform!



Direct. form II Block

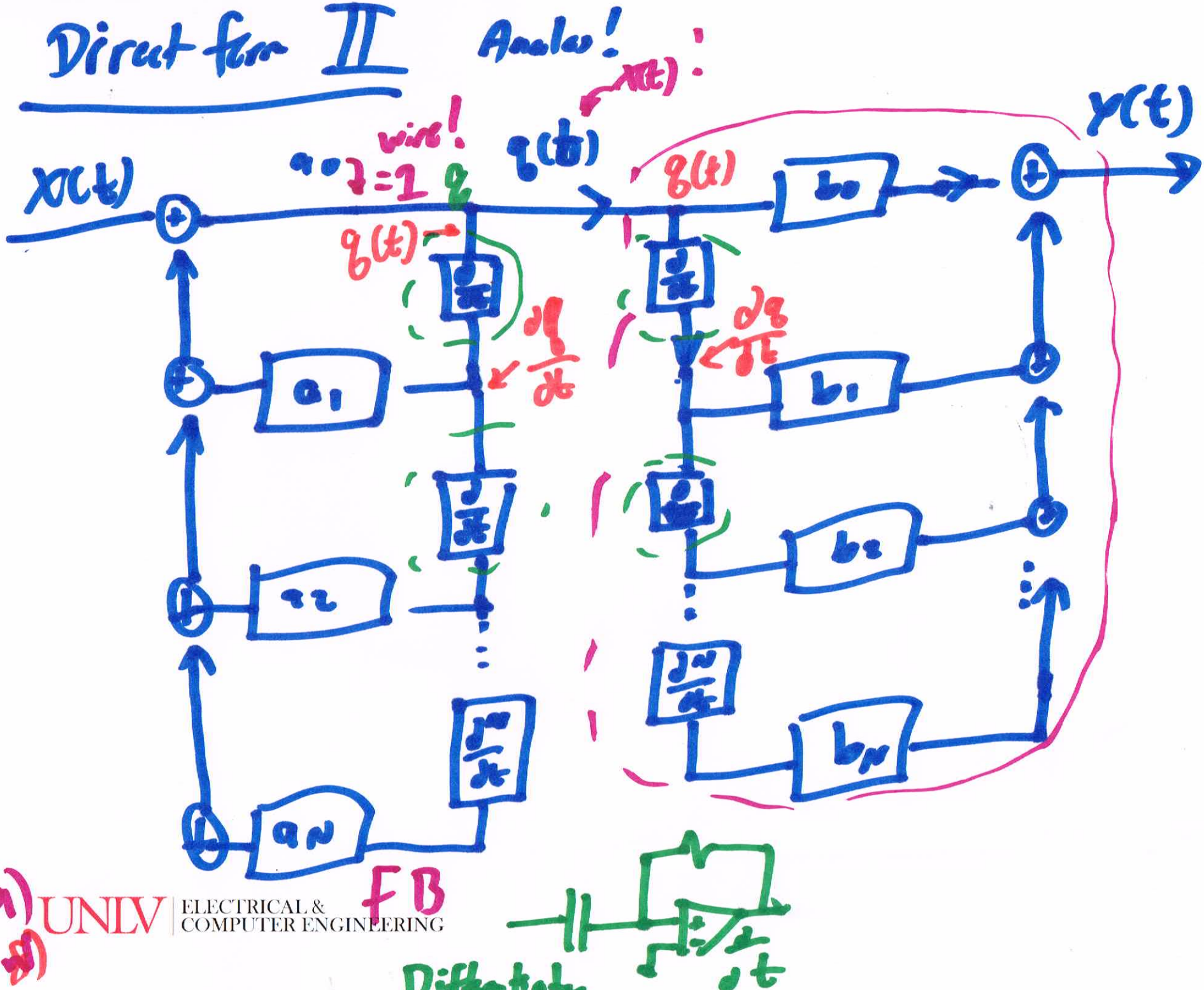




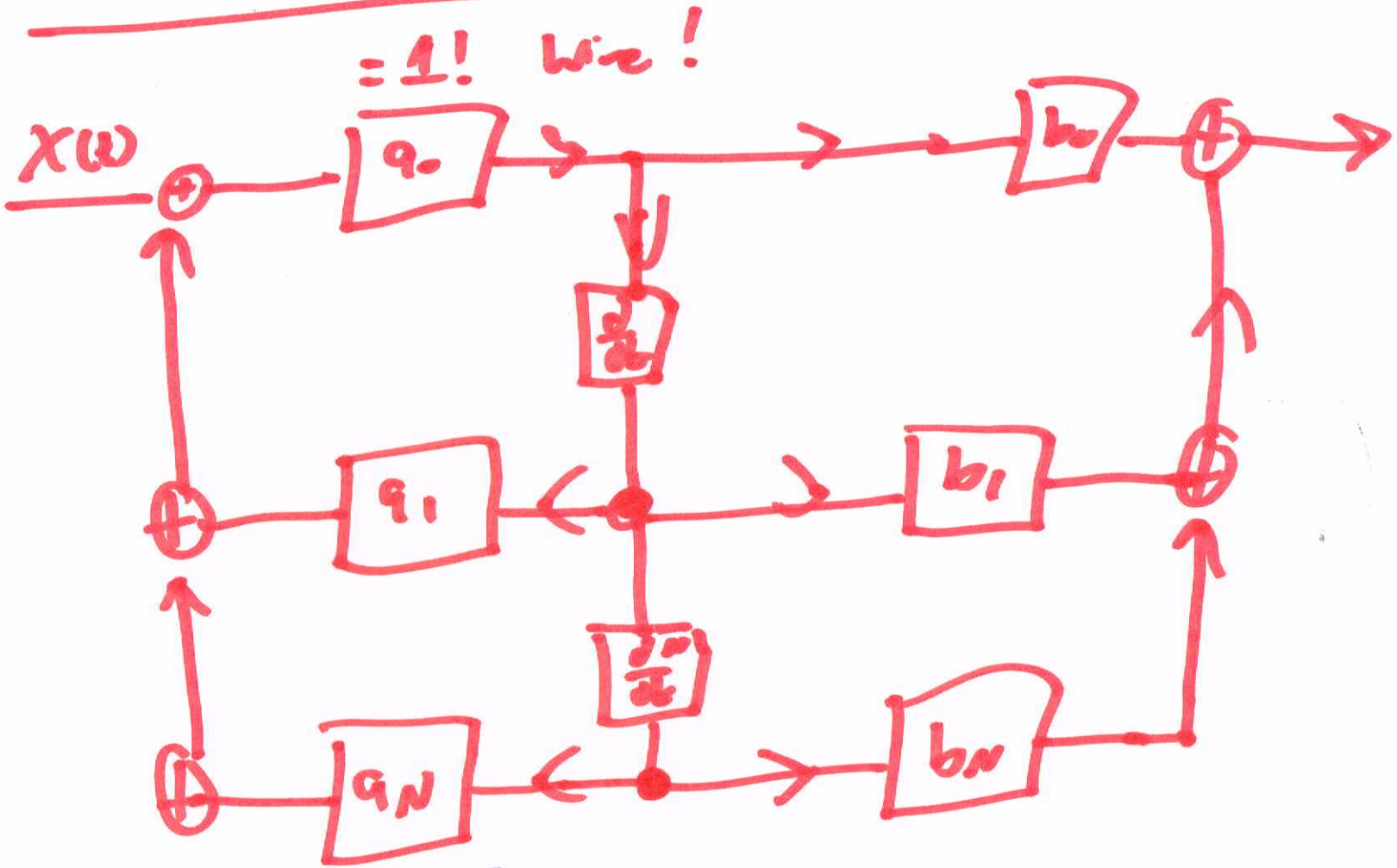
HIGH Gain Circuit!

Direct form II

Analog!



DF II Analog



stable?

Transpose Direct form II

Analog!

Canonical form!