1. Vrising(t)=VDD(1-e^(-t/τ))

τ = R1C

a. t60=RCln(40)

t60=(500)(1\*10^-12)(ln(40)) = 1.844 \* 10^(-9) seconds

b. 542170061 Hz or .542 GHz

1/t60= 542170061

2.

Diagram

Description automatically generatedGraphical user interface, chart, line chart

Description automatically generated

3.

Diagram

Description automatically generated Chart, line chart, histogram

Description automatically generated

Vout=-(r2/r1)\*vin

-(300/100)\*1=-3

The calculated output is the same as the simulated input

4.

Chart, line chart, histogram

Description automatically generated

The relationship between the input and the output is simply a derivative. The sawtooth quickly changes the sign of its slope, and that is reflected by the output jumping up and down very quickly. The derivative is just the slope, and the slope of a saw tooth is a square wave.

5.

a. 297/89 = 3.38 V

b. max: 9(3.135/(5.32 + 3.135)) = 3.534 V

min: 9(3.465/(5.88 + 3.465)) = 3.38 V

V­­­­­out=v(r2/(r1+r2))

6.

A system that I use on campus is my car. I use it to drive to the dining halls and shops nearby.

Analog: there are many analog components in a car, probably the most iconic one is the speedometer, moving in relation to the movement of the car. Another system is music, when I play music in my car it is an analog signal coming from the speakers into my ears.

Digital: Nowadays, there are lots of digital components in cars, one that I use all the time is the backup camera. The transfer of the signal from the camera on the back of my car is a digital signal, and the screen that is used to show me the camera output is also digital.