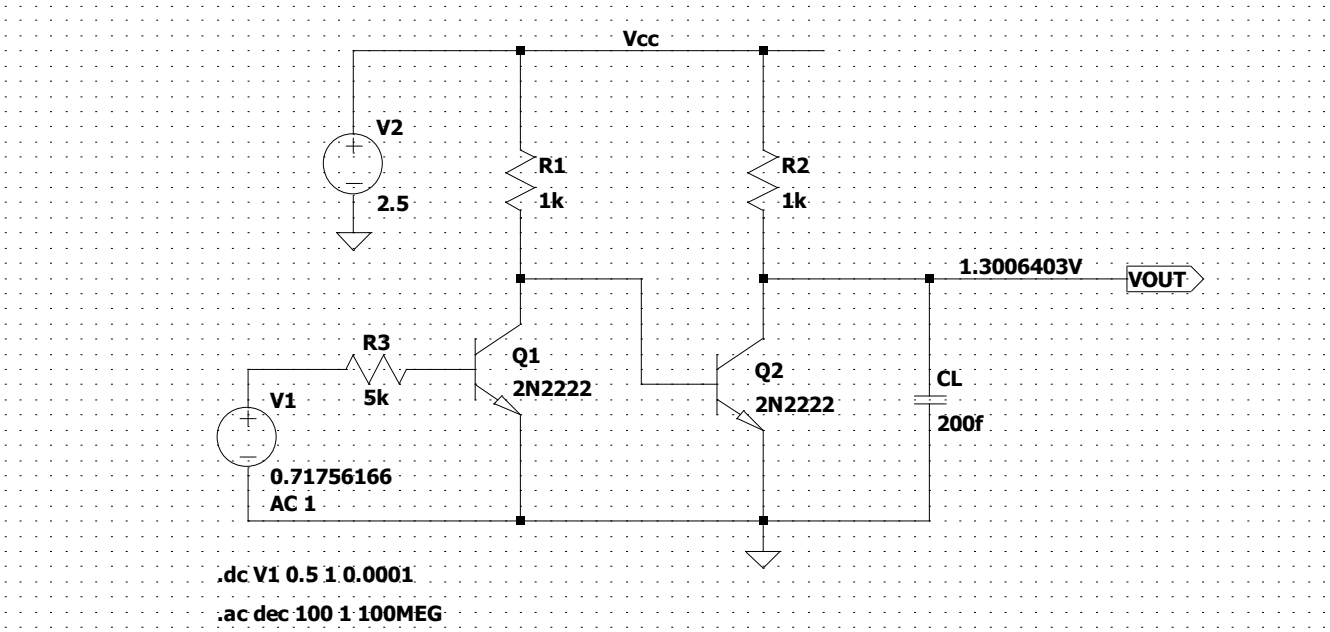
4TH QUESTION // SOLVED BY USING LTSPICE SIMULATION PROGRAM

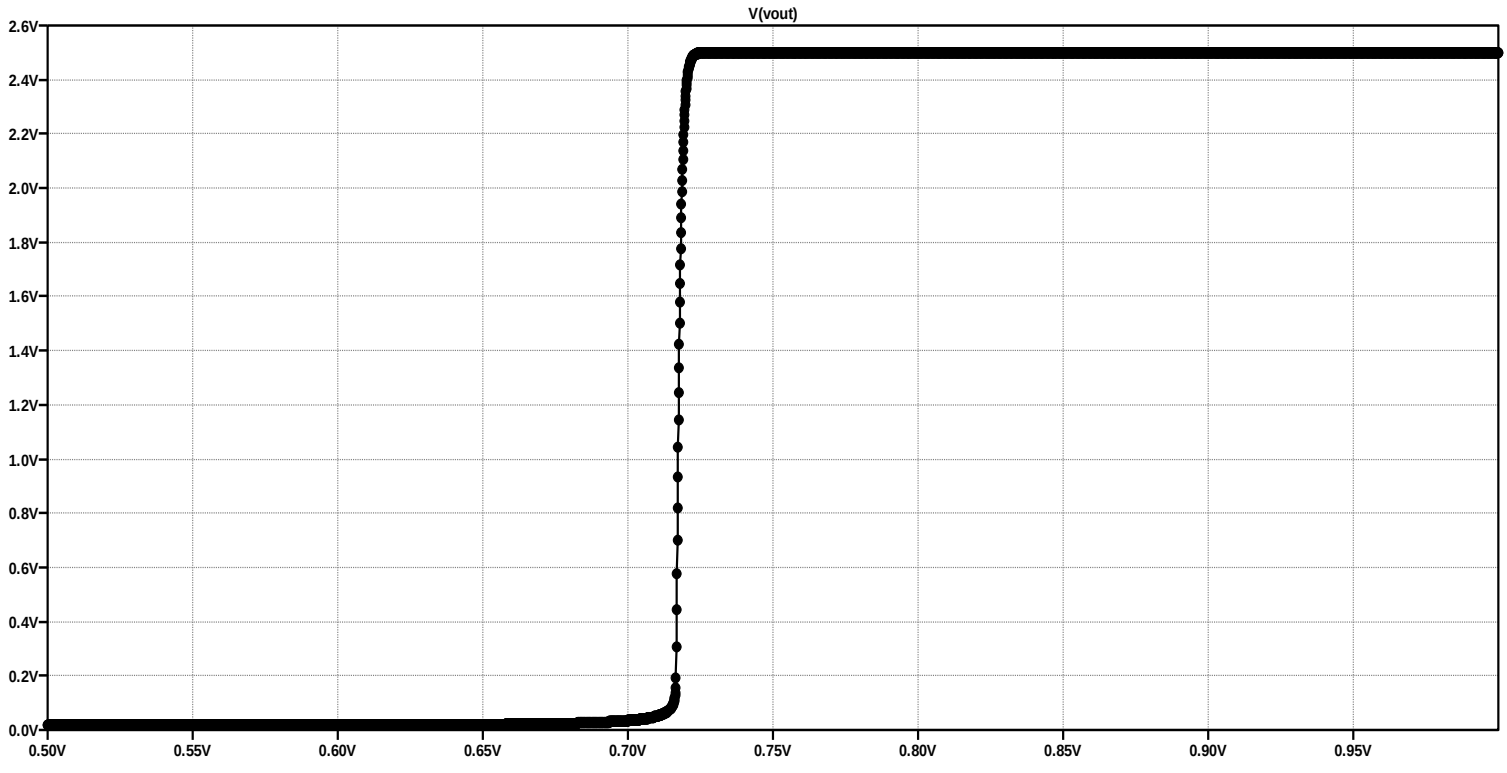
a) First of all, the circuit is drawn as shown:



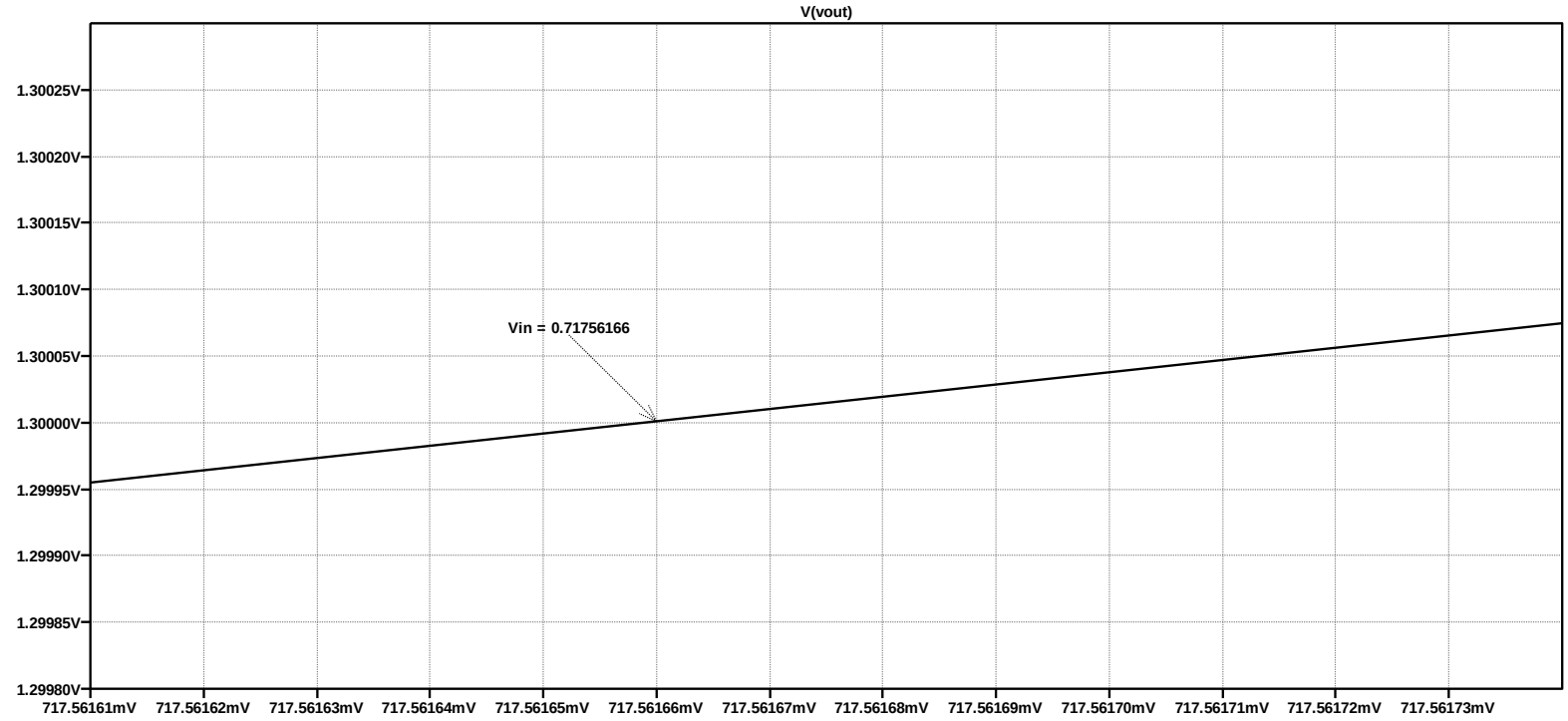
We need an input voltage that creates 1.3V at the output. Therefore, we need to sweep a specified predetermined range of V1(input voltage) to see which one succeed that.

By using the command: `.dc V1 0.5 1 0.0001`

We get a graph as shown:



From this graph we need the vertical line that intersect the 1.3V horizontal line, which can be seen by zooming the considered area:

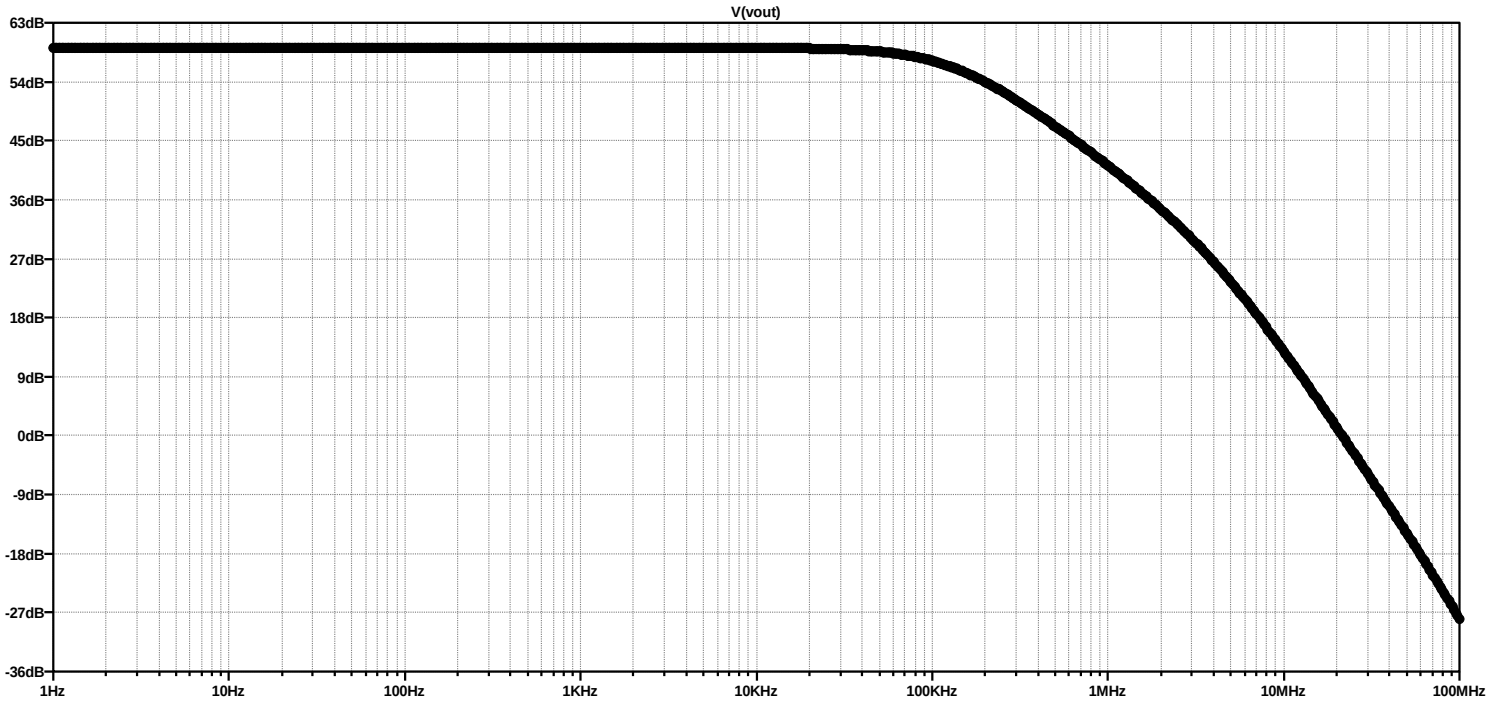


We can clearly see that Vin = 0.71756166V corresponds to Vout = 1.3V.

b-) Now, for Vin = 0.71756166V, let's see the frequency response and the 3-dB bandwidth

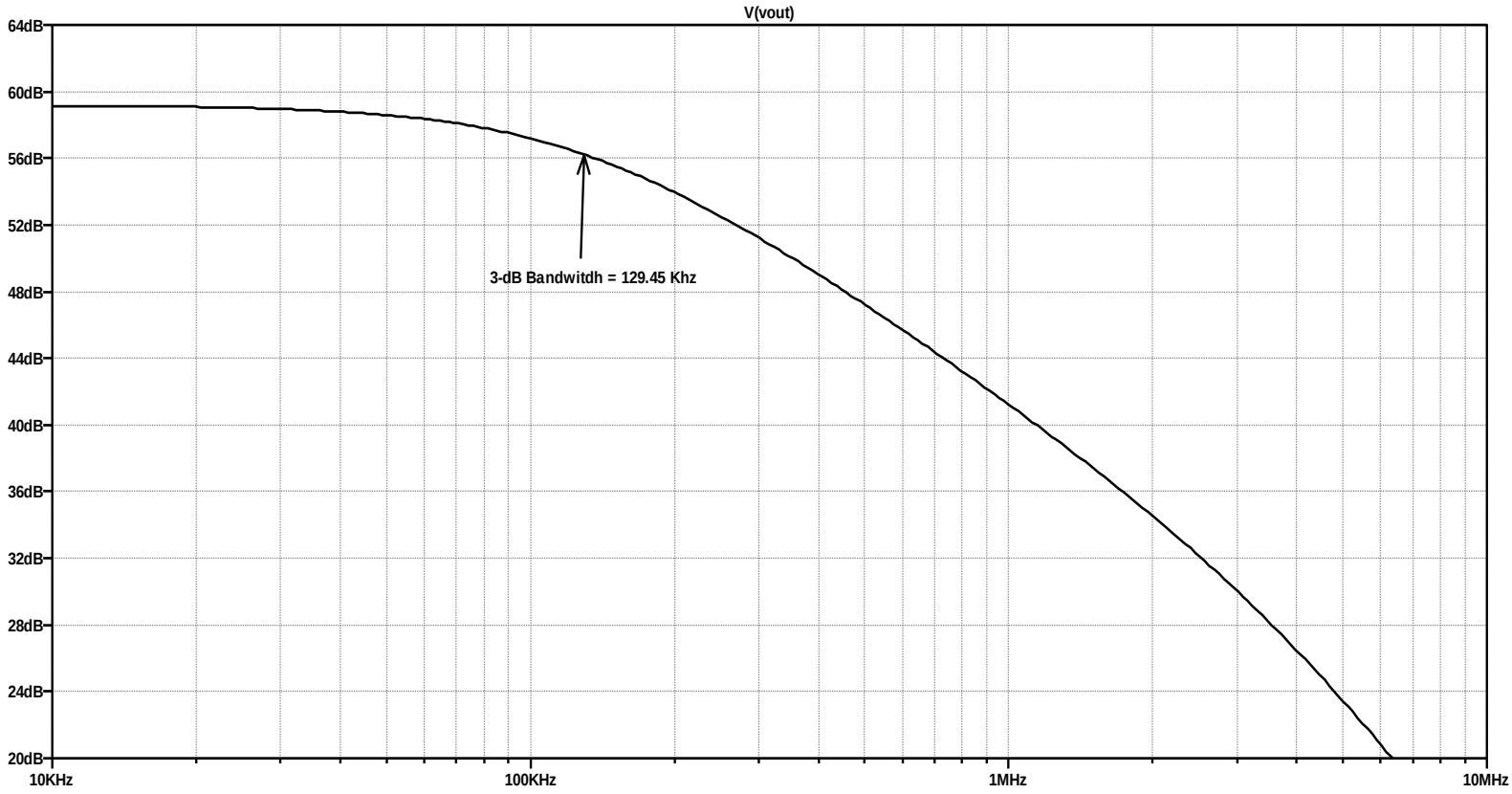
Frequency response is obtained by the command: `.ac dec 100 1 100MEG` which occupies a range from 1 Hz to 100Mhz.

And the graph is shown as:



To see both midband gain and the 3-dB bandwidth, we should zoom this a bit in to the area that we think the gain is attenuated by 3dB.

The zoomed in graph as shown:



When we plot the frequency response for Vin = 0.71756166V and Vac = 1V, we get a midband gain of around Av = 59.4 dB and the 3-dB bandwidth corresponds to the frequency at which the gain is around Av' = 56.4 dB. Then the frequency that corresponds to this gain is

Midband gain $A_v \approx 59.4\ dB$

$f_{3-dB} \approx 129.45\ Hz$