

(a) Analysis with LM324 general-purpose opamp

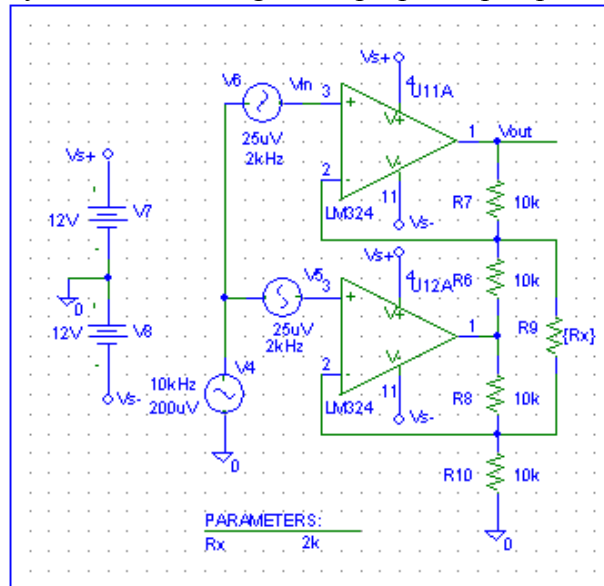


Figure 6b1.1 Differential amplifier

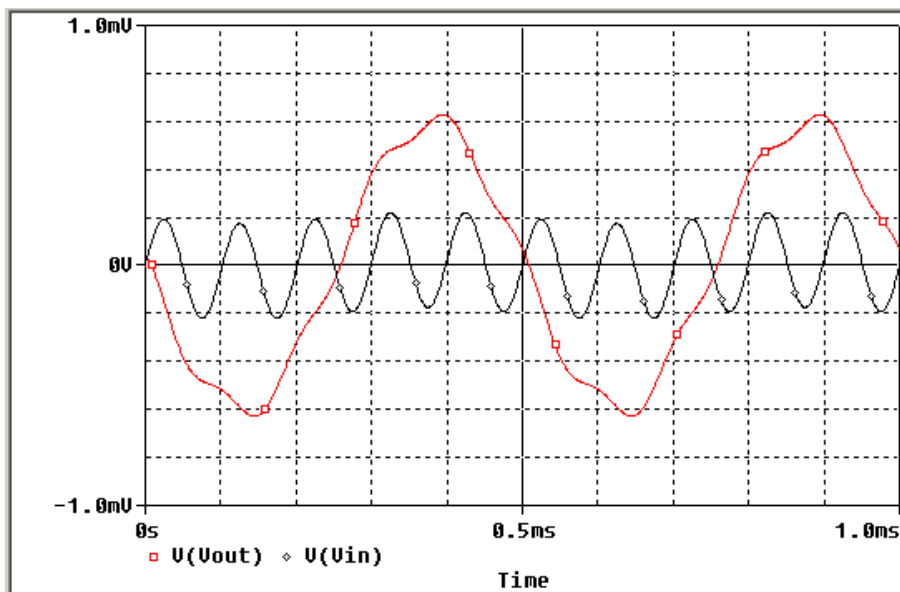


Figure 6b1.2 Output and input, with $V_{id} = 50\mu\text{V}$ at 2 kHz, $V_{icm} = 200\mu\text{V}$ at 10 kHz
LM324 general purpose opamp as driver

HARMONIC NO	FREQUENCY (HZ)	FOURIER COMPONENT	NORMALIZED COMPONENT	PHASE (DEG)	NORMALIZED PHASE (DEG)
1	2.000E+03	5.993E-04	1.000E+00	1.779E+02	0.000E+00
2	4.000E+03	2.548E-10	4.251E-07	9.276E+01	-2.631E+02
3	6.000E+03	2.378E-10	3.969E-07	9.611E+01	-4.377E+02
4	8.000E+03	2.475E-10	4.130E-07	1.034E+02	-6.083E+02
5	1.000E+04	4.771E-05	7.961E-02	7.917E+01	-8.104E+02
6	1.200E+04	2.249E-10	3.753E-07	6.999E+01	-9.975E+02
7	1.400E+04	2.216E-10	3.698E-07	7.964E+01	-1.166E+03
8	1.600E+04	2.213E-10	3.692E-07	8.196E+01	-1.341E+03
9	1.800E+04	2.212E-10	3.690E-07	8.484E+01	-1.516E+03
10	2.000E+04	2.235E-10	3.729E-07	8.513E+01	-1.694E+03
TOTAL HARMONIC DISTORTION = 7.960733E+00 PERCENT					

CMRR for the circuit = $[(5.99\text{e-}4)/50\mu\text{V}]/[(4.77\text{e-}5)/200\mu\text{V}] = 50.2$. THD = 7.96%

(b) Replace LM324 with LF411

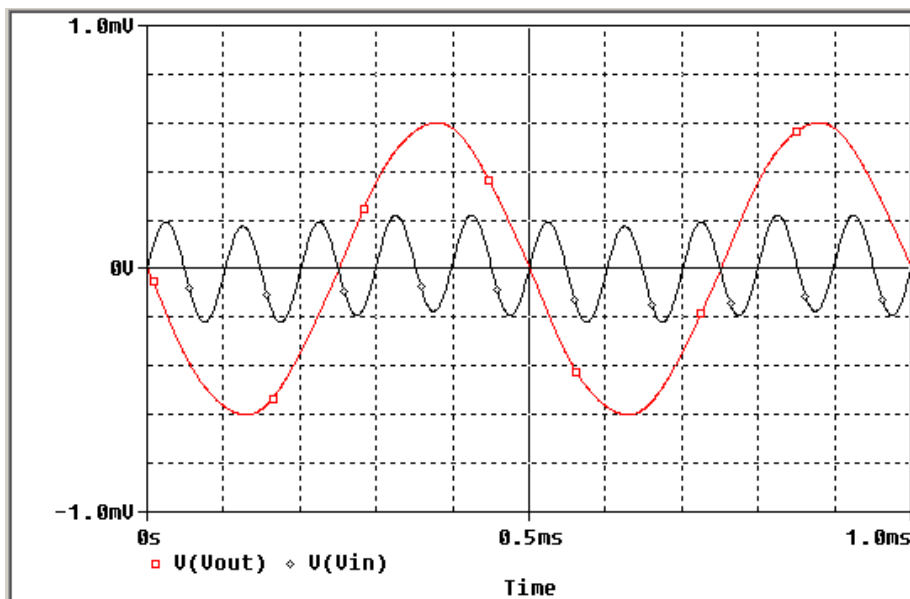


Figure 6b1.3 Output and input, with $V_{id} = 50\mu\text{V}$ at 2 kHz, $V_{icm} = 200\mu\text{V}$ at 10 kHz
LF411 high performance opamp as driver

HARMONIC NO	FREQUENCY (HZ)	FOURIER COMPONENT	NORMALIZED COMPONENT	PHASE (DEG)	NORMALIZED PHASE (DEG)
1	2.000E+03	6.000E-04	1.000E+00	1.797E+02	0.000E+00
2	4.000E+03	5.216E-11	8.694E-08	9.138E+01	-2.681E+02
3	6.000E+03	3.624E-11	6.040E-08	9.486E+01	-4.444E+02
4	8.000E+03	3.566E-11	5.943E-08	1.008E+02	-6.182E+02
5	1.000E+04	6.033E-06	1.006E-02	8.864E+01	-8.101E+02
6	1.200E+04	3.251E-11	5.419E-08	6.719E+01	-1.011E+03
7	1.400E+04	3.160E-11	5.267E-08	8.141E+01	-1.177E+03
8	1.600E+04	2.969E-11	4.949E-08	7.874E+01	-1.359E+03
9	1.800E+04	3.065E-11	5.109E-08	8.472E+01	-1.533E+03
10	2.000E+04	3.272E-11	5.454E-08	8.478E+01	-1.713E+03
TOTAL HARMONIC DISTORTION = 1.005523E+00 PERCENT					

CMRR for the circuit = $[(6.0\text{e-}4)/50\mu\text{V}]/[(6.033\text{e-}6)/200\mu\text{V}] = 398$. THD = 1.005%

