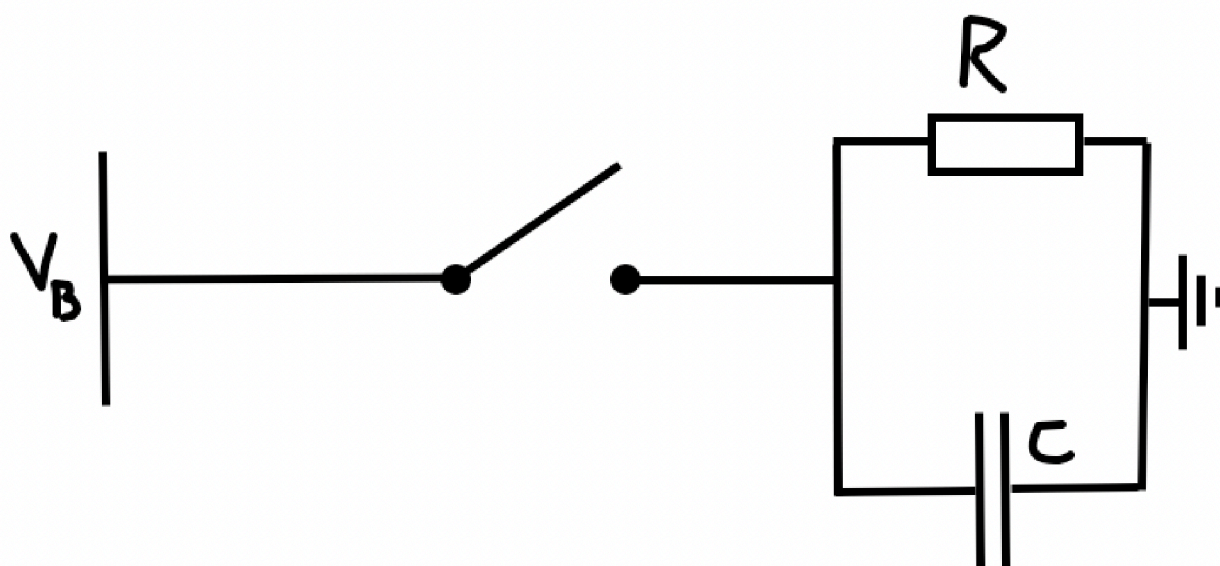
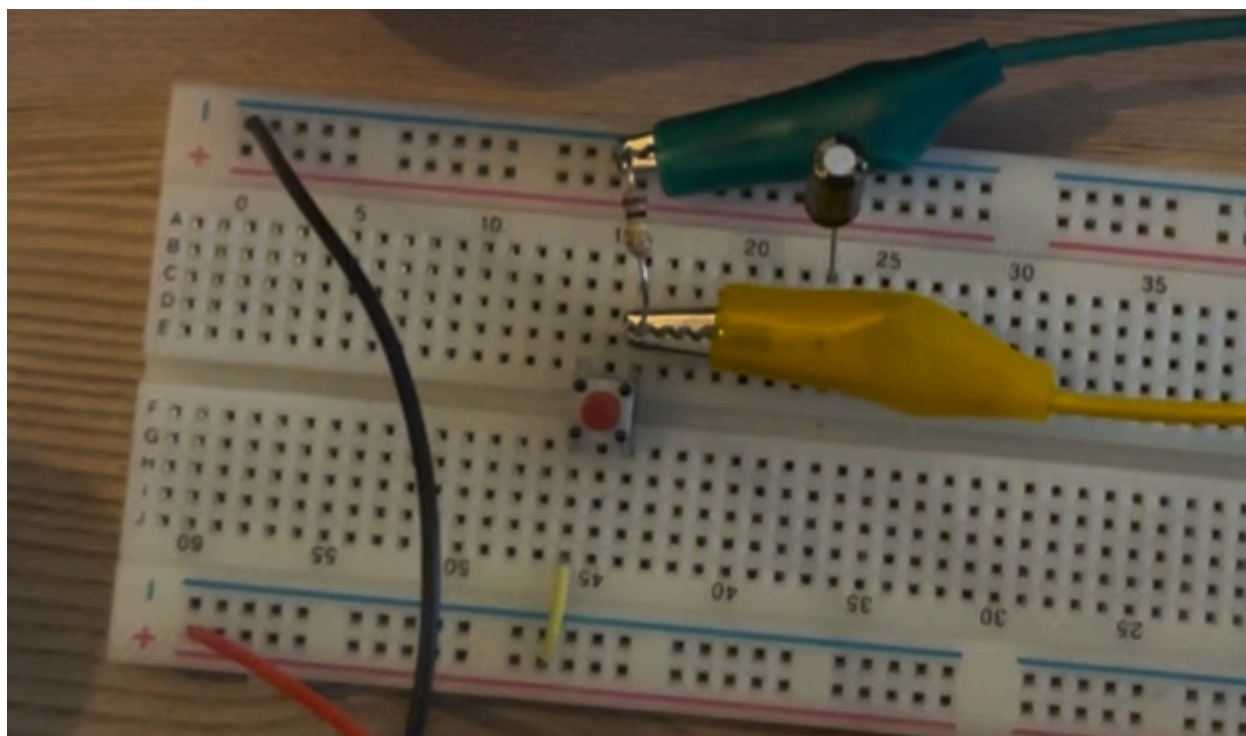


Oblig Matte 1

Oppgave RC-kretsen



Etter å ha skumlest gjennom oppgaven konkluderte jeg med at jeg skulle bruke oppsettet som vist over. Etter å ha gjort alle målinger og utregninger så så jeg at dette ikke var riktig oppsett men det jeg vil ikke gjøre alt på nytt. Derfor brukte jeg kretsen over.



Jeg startet med å holde knappen inne for å lade opp kondensatoren C. I det jeg slipper knappen sitter jeg igjen med en krets som kun har en kondensator og en motstand i serie. Det betyr at spenningen over motstanden er den samme som over kondensatoren.

Formelen for strømmen i en RC-krets er

$$i(t) = C \frac{d}{dt} v$$

Bruker vi Ohms lov $v = Ri$ for i ender vi opp med den første ordens differensiallikningen

$$\frac{v}{R} = C \dot{v}$$

$$\dot{v} = \frac{1}{RC} v$$

$$v = C_1 e^{-t/RC}$$

Løser for C_1 med initialverdien $v(0) = 9.40$

$$9.40 = C_1 e^{-0/RC}$$

$$C_1 = 9.40$$

$$v(t) = 9.40 e^{-\frac{1}{RC}t}$$

Jeg brukte en motstand med resistanse $R = 100k\Omega$ og en kondensator med kapasitans $C = 100\mu F$

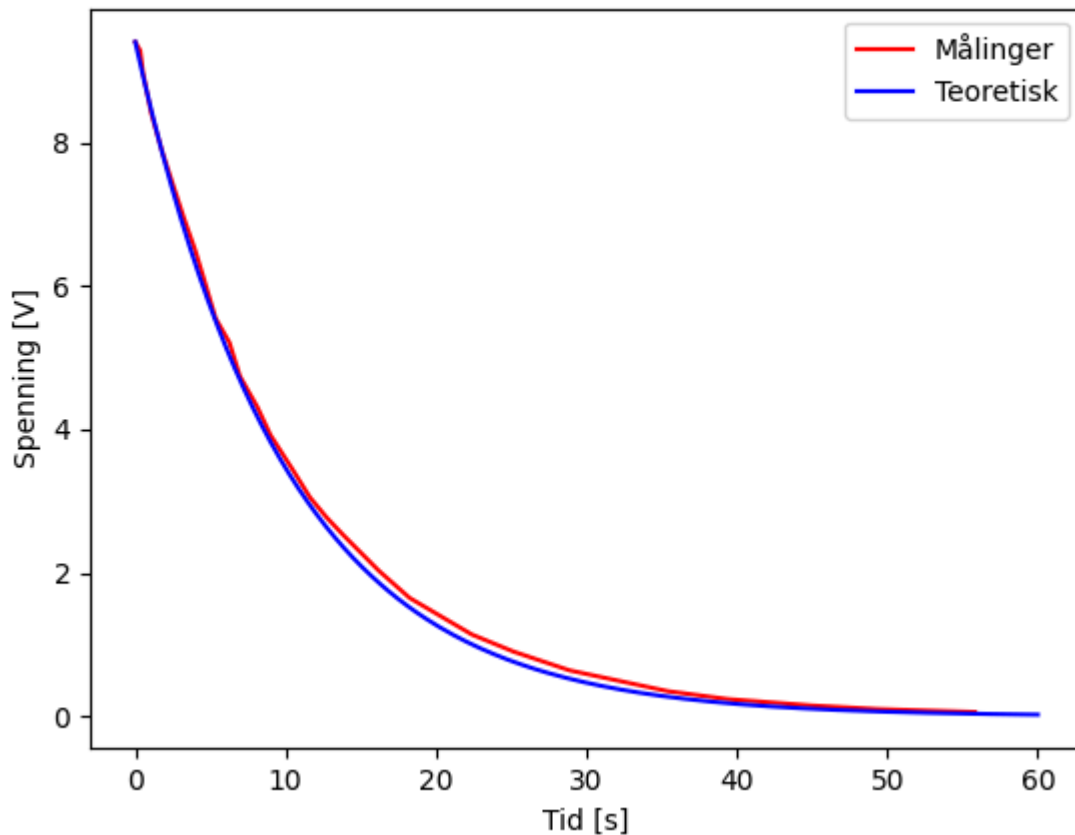
Da blir uttrykket

$$\underline{\underline{v(t) = 9.40 e^{-\frac{1}{10}t}}}$$

Målingene ble gjort ved å måle spenningen over motstanden og filme for å få tid og tallverdier samtidig.

Dette ble plottet i python sammen med den teoretiske for å kunne sammenlikne.

Spenning i en RC-krets



```

1  import numpy as np
2  import matplotlib.pyplot as plt
3
4  # Konstanter
5  R = 100000
6  C = 100 * 10**(-6)
7
8  # Målinger
9  time = [4.15, 4.48, 4.66, 5.21, 5.93, 6.69, 7.41, 8.13, 8.71, 9.49, 10.41, 11.11, 12.27, 13.14, 14.01, 14.89, 15.77, 16.65, 17.53, 18.41, 19.29, 20.17, 21.05, 21.93, 22.81, 23.69, 24.57, 25.45, 26.33, 27.21, 28.09, 28.97, 29.85, 30.73, 31.61, 32.49, 33.37, 34.25, 35.13, 36.01, 36.89, 37.77, 38.65, 39.53, 40.41, 41.29, 42.17, 43.05, 43.93, 44.81, 45.69, 46.57, 47.45, 48.33, 49.21, 50.09, 50.97, 51.85, 52.73, 53.61, 54.49, 55.37, 56.25, 57.13, 58.01, 58.89, 59.77, 60.65, 61.53, 62.41, 63.29, 64.17, 65.05, 65.93, 66.81, 67.69, 68.57, 69.45, 70.33, 71.21, 72.09, 72.97, 73.85, 74.73, 75.61, 76.49, 77.37, 78.25, 79.13, 80.01, 80.89, 81.77, 82.65, 83.53, 84.41, 85.29, 86.17, 87.05, 87.93, 88.81, 89.69, 90.57, 91.45, 92.33, 93.21, 94.09, 94.97, 95.85, 96.73, 97.61, 98.49, 99.37, 100.25, 101.13, 102.01, 102.89, 103.77, 104.65, 105.53, 106.41, 107.29, 108.17, 109.05, 109.93, 110.81, 111.69, 112.57, 113.45, 114.33, 115.21, 116.09, 116.97, 117.85, 118.73, 119.61, 120.49, 121.37, 122.25, 123.13, 124.01, 124.89, 125.77, 126.65, 127.53, 128.41, 129.29, 130.17, 131.05, 131.93, 132.81, 133.69, 134.57, 135.45, 136.33, 137.21, 138.09, 138.97, 139.85, 140.73, 141.61, 142.49, 143.37, 144.25, 145.13, 146.01, 146.89, 147.77, 148.65, 149.53, 150.41, 151.29, 152.17, 153.05, 153.93, 154.81, 155.69, 156.57, 157.45, 158.33, 159.21, 160.09, 160.97, 161.85, 162.73, 163.61, 164.49, 165.37, 166.25, 167.13, 168.01, 168.89, 169.77, 170.65, 171.53, 172.41, 173.29, 174.17, 175.05, 175.93, 176.81, 177.69, 178.57, 179.45, 180.33, 181.21, 182.09, 182.97, 183.85, 184.73, 185.61, 186.49, 187.37, 188.25, 189.13, 190.01, 190.89, 191.77, 192.65, 193.53, 194.41, 195.29, 196.17, 197.05, 197.93, 198.81, 199.69, 200.57, 201.45, 202.33, 203.21, 204.09, 204.97, 205.85, 206.73, 207.61, 208.49, 209.37, 210.25, 211.13, 212.01, 212.89, 213.77, 214.65, 215.53, 216.41, 217.29, 218.17, 219.05, 219.93, 220.81, 221.69, 222.57, 223.45, 224.33, 225.21, 226.09, 226.97, 227.85, 228.73, 229.61, 230.49, 231.37, 232.25, 233.13, 234.01, 234.89, 235.77, 236.65, 237.53, 238.41, 239.29, 240.17, 241.05, 241.93, 242.81, 243.69, 244.57, 245.45, 246.33, 247.21, 248.09, 248.97, 249.85, 250.73, 251.61, 252.49, 253.37, 254.25, 255.13, 256.01, 256.89, 257.77, 258.65, 259.53, 260.41, 261.29, 262.17, 263.05, 263.93, 264.81, 265.69, 266.57, 267.45, 268.33, 269.21, 270.09, 270.97, 271.85, 272.73, 273.61, 274.49, 275.37, 276.25, 277.13, 278.01, 278.89, 279.77, 280.65, 281.53, 282.41, 283.29, 284.17, 285.05, 285.93, 286.81, 287.69, 288.57, 289.45, 290.33, 291.21, 292.09, 292.97, 293.85, 294.73, 295.61, 296.49, 297.37, 298.25, 299.13, 300.01, 300.89, 301.77, 302.65, 303.53, 304.41, 305.29, 306.17, 307.05, 307.93, 308.81, 309.69, 310.57, 311.45, 312.33, 313.21, 314.09, 314.97, 315.85, 316.73, 317.61, 318.49, 319.37, 320.25, 321.13, 322.01, 322.89, 323.77, 324.65, 325.53, 326.41, 327.29, 328.17, 329.05, 329.93, 330.81, 331.69, 332.57, 333.45, 334.33, 335.21, 336.09, 336.97, 337.85, 338.73, 339.61, 340.49, 341.37, 342.25, 343.13, 344.01, 344.89, 345.77, 346.65, 347.53, 348.41, 349.29, 350.17, 351.05, 351.93, 352.81, 353.69, 354.57, 355.45, 356.33, 357.21, 358.09, 358.97, 359.85, 360.73, 361.61, 362.49, 363.37, 364.25, 365.13, 366.01, 366.89, 367.77, 368.65, 369.53, 370.41, 371.29, 372.17, 373.05, 373.93, 374.81, 375.69, 376.57, 377.45, 378.33, 379.21, 380.09, 380.97, 381.85, 382.73, 383.61, 384.49, 385.37, 386.25, 387.13, 388.01, 388.89, 389.77, 390.65, 391.53, 392.41, 393.29, 394.17, 395.05, 395.93, 396.81, 397.69, 398.57, 399.45, 400.33, 401.21, 402.09, 402.97, 403.85, 404.73, 405.61, 406.49, 407.37, 408.25, 409.13, 410.01, 410.89, 411.77, 412.65, 413.53, 414.41, 415.29, 416.17, 417.05, 417.93, 418.81, 419.69, 420.57, 421.45, 422.33, 423.21, 424.09, 424.97, 425.85, 426.73, 427.61, 428.49, 429.37, 430.25, 431.13, 432.01, 432.89, 433.77, 434.65, 435.53, 436.41, 437.29, 438.17, 439.05, 439.93, 440.81, 441.69, 442.57, 443.45, 444.33, 445.21, 446.09, 446.97, 447.85, 448.73, 449.61, 450.49, 451.37, 452.25, 453.13, 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1100.81, 1101.69, 1102.57, 1103.45, 1104.33, 1105.21, 1106.09, 1106.97, 1107.85, 1108.73, 1109.61, 1110.49, 1111.37, 1112.25, 1113.13, 1114.01, 1114.89, 1115.77, 1116.65, 1117.53, 1118.41, 1119.29, 1120.17, 1121.05, 1121.93, 1122.81, 1123.69, 1124.57, 1125.45, 1126.33, 1127.21, 1128.09, 1128.97, 1129.85, 1130.73, 1131.61, 1132.49, 1133.37, 1134.25, 1135.13, 1136.01, 1136.89, 1137.77, 1138.65, 1139.53, 1140.41, 1141.29, 1142.17, 1143.05, 1143.93, 1144.81, 1145.69, 1146.57, 1147.45, 1148.33, 1149.21, 1150.09, 1150.97, 1151.85, 1152.73, 1153.61, 1154.49, 1155.37, 1156.25, 1157.13, 1158.01, 1158.89, 1159.77, 1160.65, 1161.53, 1162.41, 1163.29, 1164.17, 1165.05, 1165.93, 1166.81, 1167.69, 1168.57, 1169.45, 1170.33, 1171.21, 1172.09, 1172.97, 1173.85, 1174.73, 1175.61, 1176.49, 1177.37, 1178.25, 1179.13, 1180.01, 1180.89, 1181.77, 1182.65, 1183.53, 1184.41, 1185.29, 1186.17, 1187.05, 1187.93, 1188.81, 1189.69, 1190.57, 1191.45, 1192.33, 1193.21, 1194.09, 1194.97, 1195.85, 1196.73, 1197.61, 1198.49, 1199.37, 1200.25, 1201.13, 1202.01, 1202.89, 1203.77, 1204.65, 1205.53, 1206.41, 1207.29, 1208.17, 1209.05, 1209.93, 1210.81, 1211.69, 1212.57, 1213.45, 1214.33, 1215.21, 1216.09, 1216.97, 1217.85, 1218.73, 1219.61, 1220.49, 1221.37, 1222.25, 1223.13, 1224.01, 1224.89, 1225.77, 1226.65, 1227.53, 1228.41, 1229.29, 1230.17, 1231.05, 1231.93, 1232.81, 1233.69, 1234.57, 1235.45, 1236.33, 1237.21, 1238.09, 1238.97, 1239.85, 1240.73, 1241.61, 1242.49, 1243.37, 1244.25, 1245.13, 1246.01, 1246.89, 1247.77, 1248.65, 1249.53, 1250.41, 1251.29, 1252.17, 1253.05, 1253.93, 1254.81, 1255.69, 1256.57, 1257.45, 1258.33, 1259.21, 1260.09, 1260.97, 1261.85, 1262.73, 1263.61, 1264.49, 1265.37, 1266.25, 1267.13, 1268.01, 1268.89, 1269.77, 1270.65, 1271.53, 1272.41, 1273.29, 1274.17, 1275.05, 1275.93, 1276.81, 1277.69, 1278.57, 1279.45, 1280.33, 1281.21, 1282.09, 1282.97, 1283.85, 1284.73, 1285.61, 1286.49, 1287.37, 1288.25, 1289.13, 1290.01, 1290.89, 1291.77, 1292.65, 1293.53, 1294.41, 1295.29, 1296.17, 1297.05, 1297.93, 1298.81, 1299.69, 1300.57, 
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Som vi ser fra figuren stemmer teorien godt overens med målingene. Der det ikke stemmer skyldes mest sannsynlig at motstanden og kondensatoren ikke har nøyaktige verdier.

Denne oppgaven var gjort mulig av at en jeg bor med hadde et multimeter, selv om han insisterte på at jeg skulle bruke altimeteret hans i stedet

