

ELEN 50 Project 1
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Friday 2:15-5:00p

Pre-Lab:

$1/R_2 + 1/R_4 + 1/R_6 + 1/R_7$	$-1/R_6$	$-1/R_4$	V_g/R_2
$-1/R_6$	$1/R_1 + 1/R_6 + 1/R_8$	0	V_g/R_1
$-1/R_4$	0	$1/R_3 + 1/R_4 + 1/R_5 + 1/R_{10}$	V_g/R_3

Thevenin Resistance: 750 Ohms

OCV (V_{th}): 9 Volts

MATLAB:

Creating static values and matrices

1

Calculating power values

1

Creating static values and matrices

```
Vg = 12;
R1 = 1000;
R4 = 1000;
R6 = 1000;
R8 = 1000;
R10 = 1000;
R2 = 1500;
R3 = 1500;
R5 = 1500;
R7 = 1500;
R9 = [0:1:10^3, 10^3+1:10:10^5];
A_0 = [1/R2+1/R4+1/R6+1/R7, -1/R6, -1/R7, -1/R4;
       -1/R6, 1/R1+1/R6+1/R8, -1/R8, 0;
       -1/R7, -1/R8, 1/R8+1/R7+1/R5, -1/R5;
       -1/R4, 0, -1/R5, 1/R3+1/R4+1/R5+1/R10];
A_1 = [0, 0, 0, 0;
       0, 0, 0, 0;
       0, 0, 1, 0;
       0, 0, 0, 0];
b = [Vg/R2; Vg/R1; 0; Vg/R3];
```

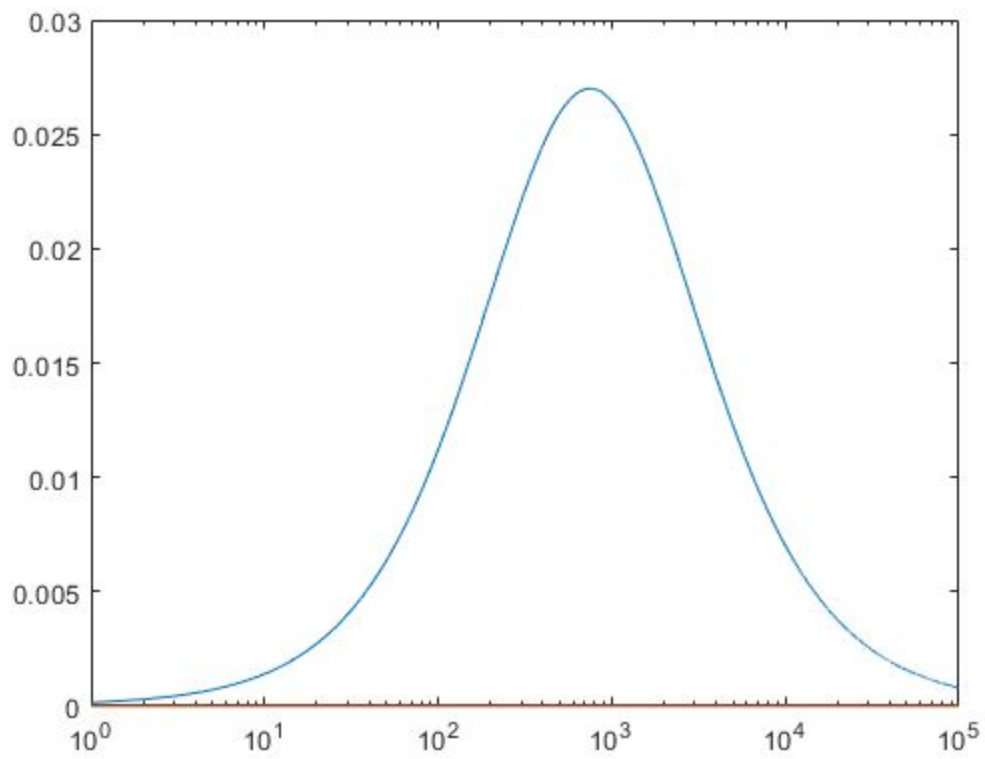
Calculating power values

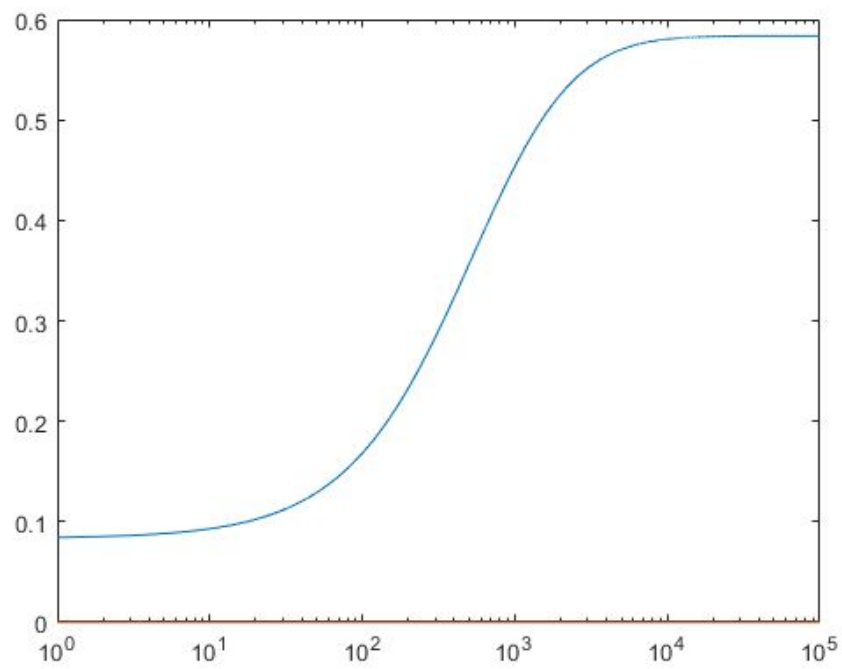
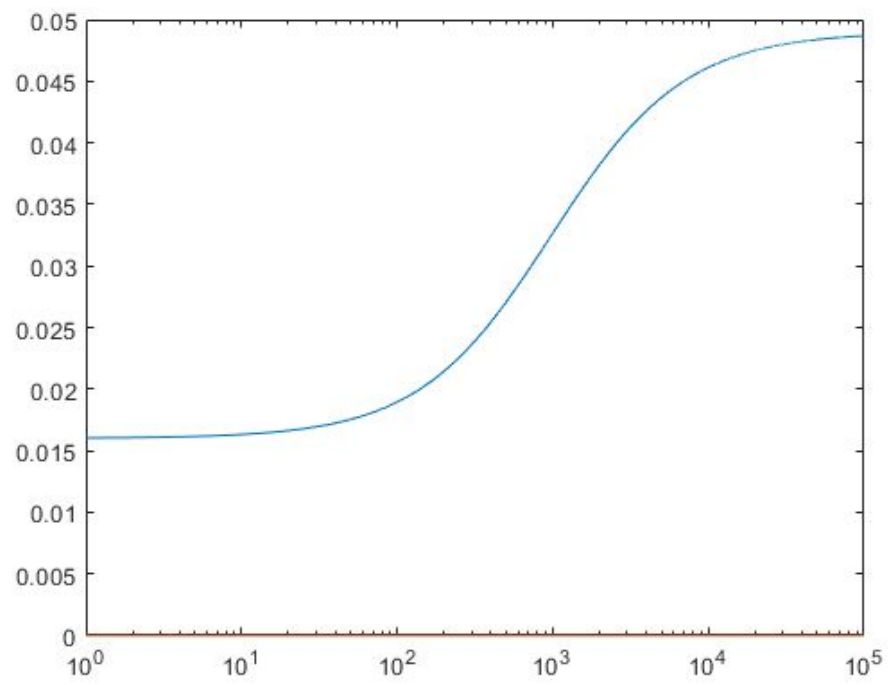
```
PR9 = zeros(length(R9));
PR10 = zeros(length(R9));
eta = zeros(length(R9));

for iter = 1:length(R9)
    R9_iter = R9(iter);
    A = A_0+(1/R9_iter)*A_1;
    V = A\b;
    PR9(iter) = V(3)^2/R9_iter;
    PR10(iter) = V(4)^2/R10;
    P_G = Vg*((Vg-V(2))/R1+(Vg-V(1))/R2+(Vg-V(4))/R3);
    eta(iter) = (PR9(iter)+PR10(iter))/P_G;
end

figure(1)
semilogx(R9, PR9)
```

```
figure(2)
semilogx(R9, PR10)
figure(3)
semilogx(R9, eta)
```





Physical Build:

R9 (Ohms)	V9 (Volts)	P9 (Watts)	V10 (Volts)	P10 (Watts)	Is (Amps)	Pg (Watts)	ETA
100.0000	1.2241	0.0150	6.3203	0.0040	0.0131	0.1572	0.1207
300.0000	3.0301	0.0306	7.1822	0.0052	0.0110	0.1325	0.2700
500.0000	4.2995	0.0370	7.7878	0.0061	0.0096	0.1151	0.3740
700.0000	5.2422	0.0393	8.2379	0.0068	0.0085	0.1022	0.4504
900.0000	5.9691	0.0396	8.5847	0.0074	0.0077	0.0923	0.5089
1100.0000	6.5409	0.0389	8.8575	0.0078	0.0071	0.0846	0.5525
1300.0000	7.0121	0.0378	9.0822	0.0082	0.0065	0.0781	0.5898
1500.0000	7.4025	0.0365	9.2686	0.0086	0.0061	0.0728	0.6195
1700.0000	7.7326	0.0352	9.4260	0.0089	0.0057	0.0684	0.6441
750.0000	5.4412	0.0395	8.3320	0.0069	0.0083	0.0997	0.4655

We had an issue with our R10 resistor being a 10k Ohm resistor rather than a 1k Ohm resistor. We found this out late in lab therefore we calculated our P10 values with $P10 = V10^2 / 10k$.