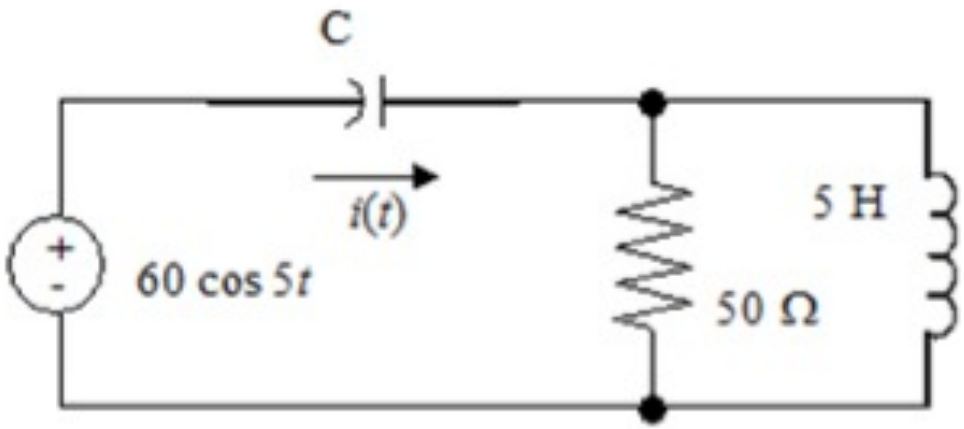
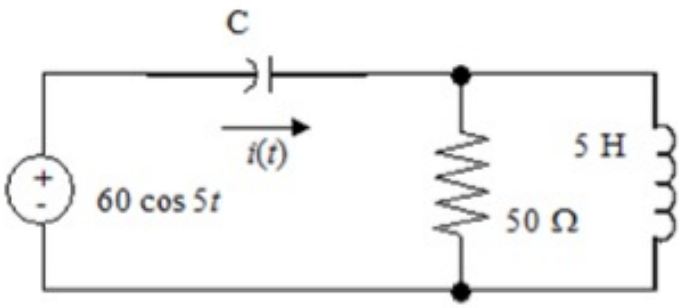
Lecture 23
Phasors – 9 of 9

design examples

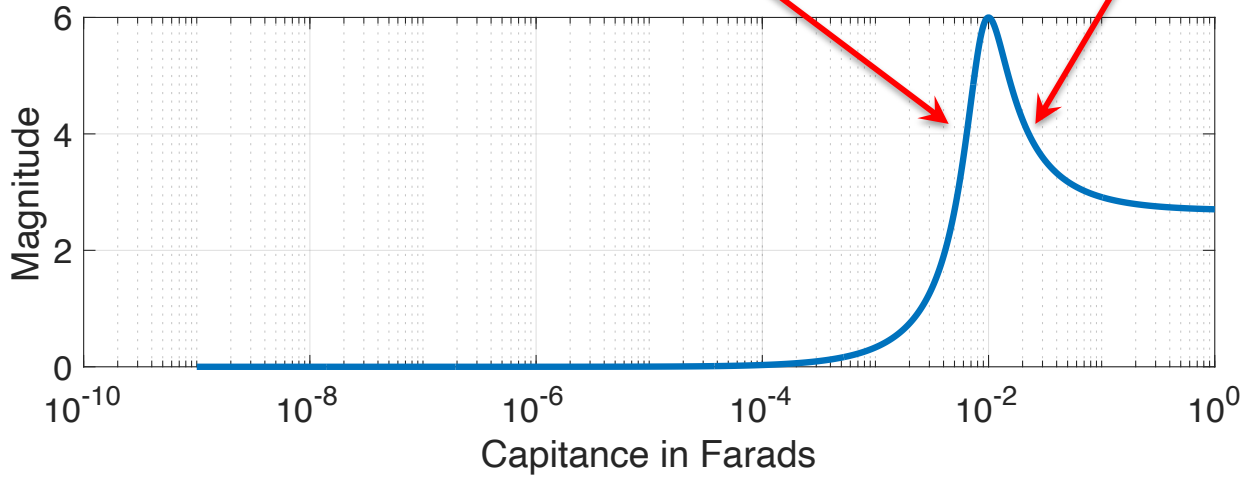
Example: Find C so that the magnitude of $i(t)$ is 4 amps.

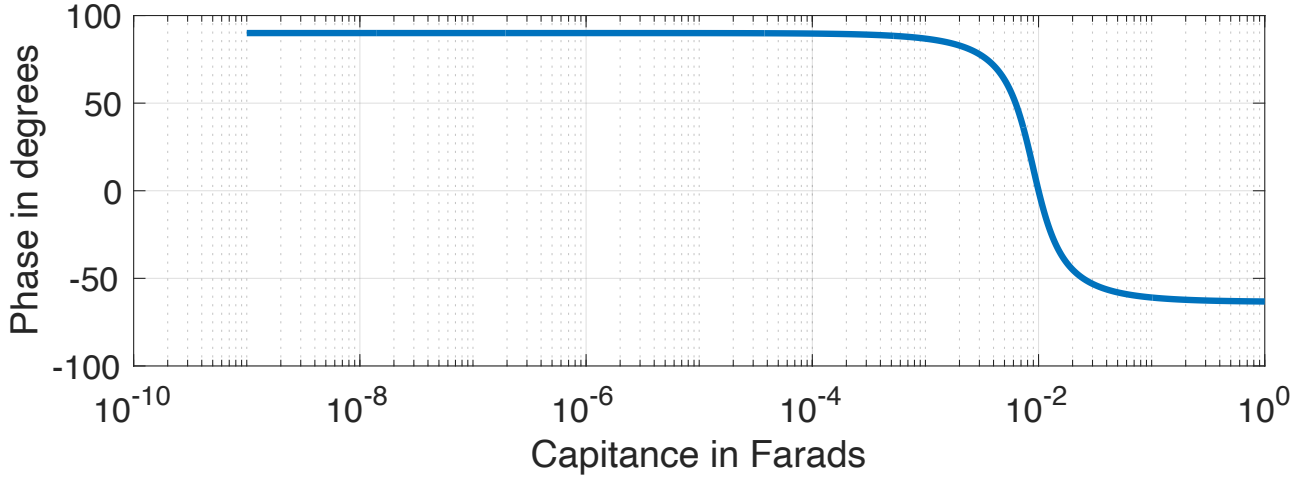


```
om = 5;
R = 50;
L = 5;
ZL = 1j*om*L;
C = logspace(-9,0,1000);
ZC = 1./(1j*om*C);
Z = ZC + 50*ZL/(50+ZL);
I = 60./Z;
```

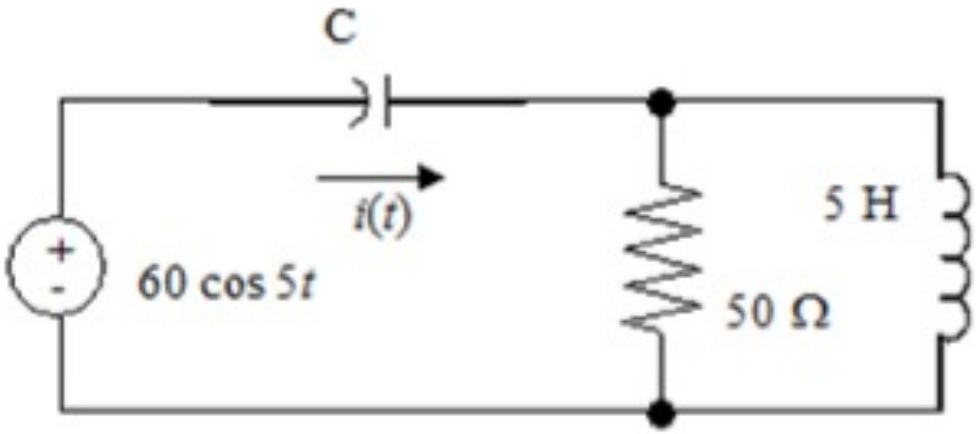


$|I| = 4$ occurs in two spots !!



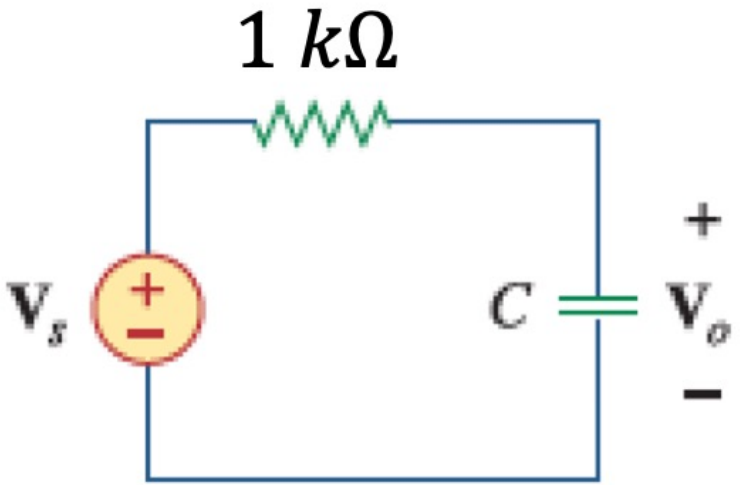


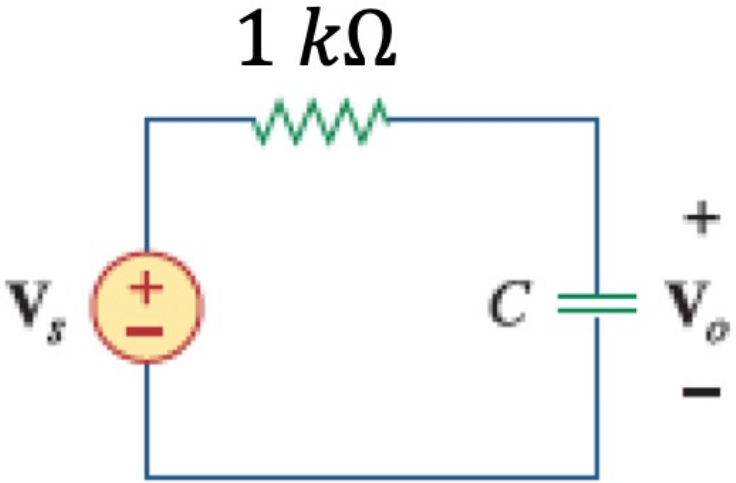
Let’s actually solve for C



$6.4\ mF;\ 22.7\ mF$

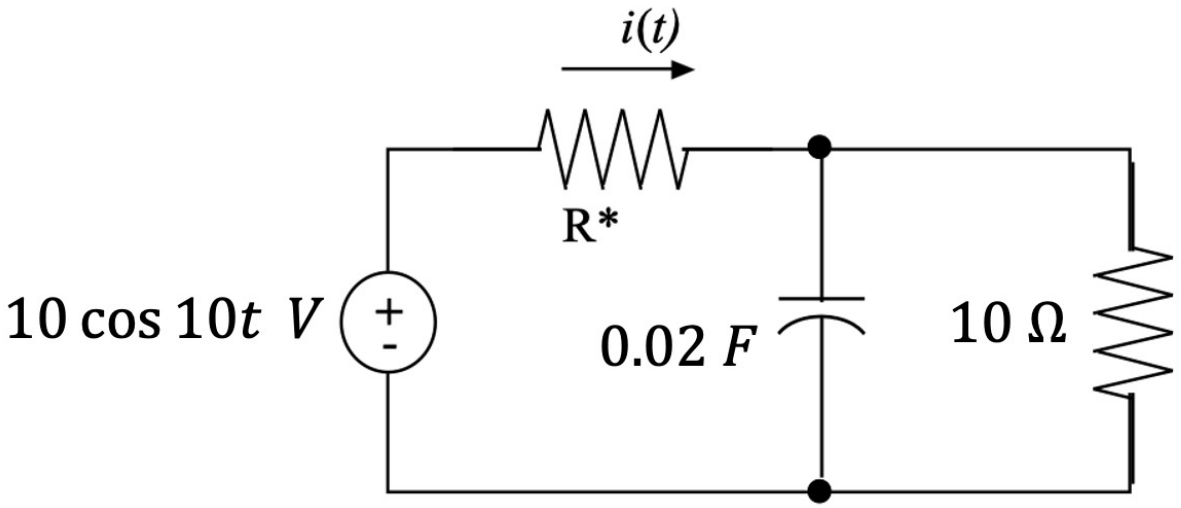
Example: The circuit shown is a low pass filter meaning that it passes lower frequency sinusoids and attenuates higher frequency sinusoids. Find a value for the capacitor C so that all sinusoids above 1000 Hz in frequency are attenuated by at least 90% (i.e. their amplitude scaling, |Vo/Vs|, is at most 0.1). Using your result what happens to a 60 Hz signal? How is its amplitude changed? How is its phase angle changed?





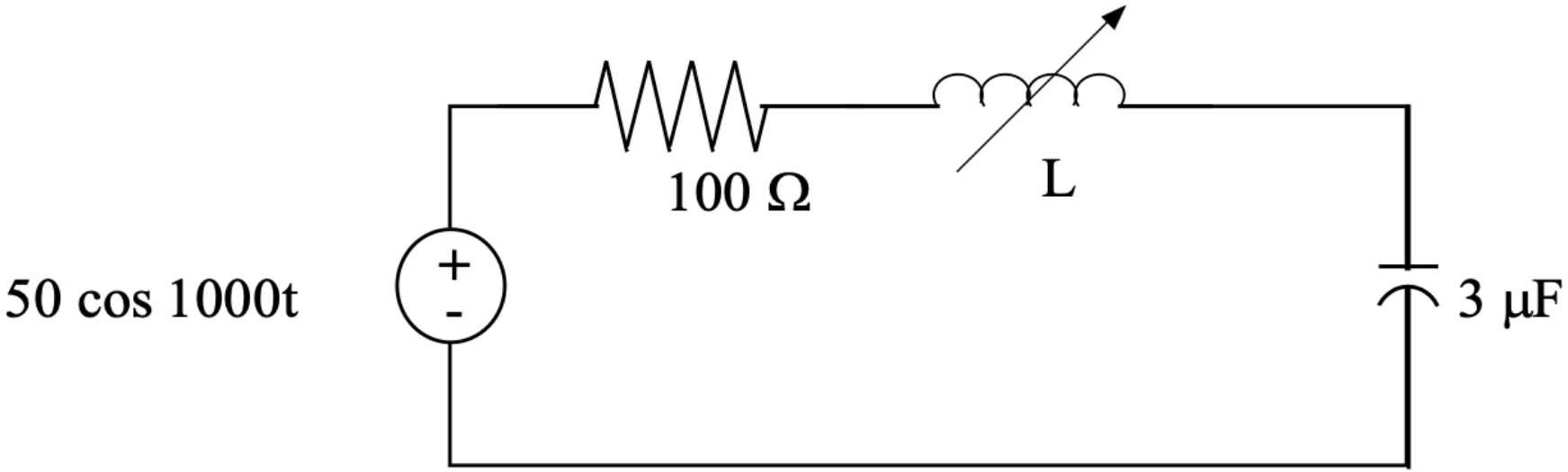
$1.58\ \mu F; 85.9\ \%; -20.8°$

Example: Find the resistor R* so that the magnitude of the current $i(t)$ is 1 A.



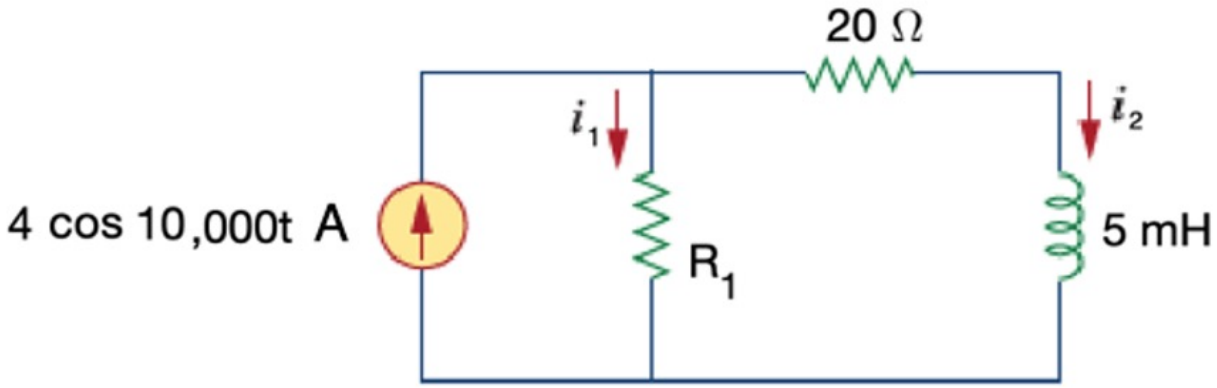
97.9 Ω

Example: Find the inductor value to maximize the magnitude of the voltage appearing across the capacitor. What is that magnitude?



$\frac{1}{3}H, \frac{10}{3}\mathrm{V}$

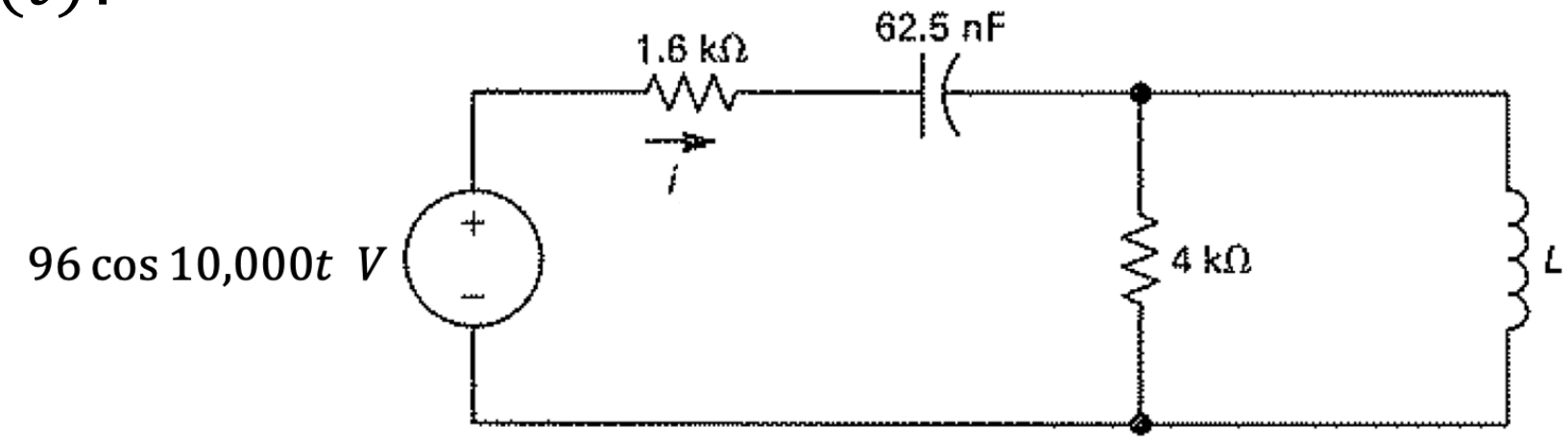
Example: what value for resistor R_1 results in the two currents, i_1 and i_2, having the same magnitude (but might be different phase angles)? What is that magnitude?



$53.9\ \Omega; 2.42\ A$

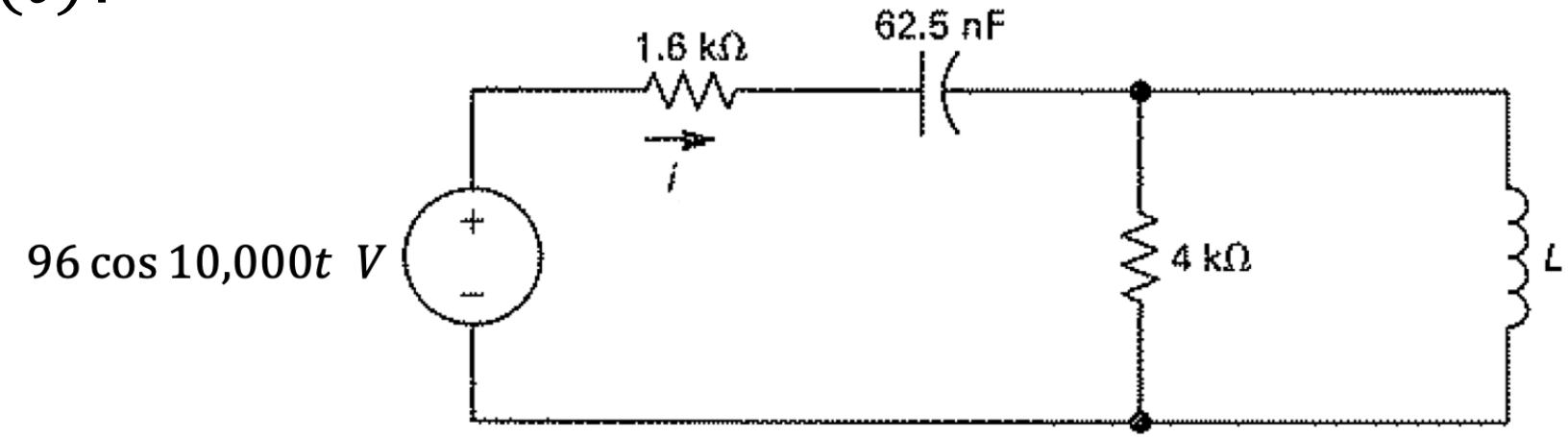
$53.9\ \Omega; 2.42\ A$

Practice problem: find the inductor value so that the current i is "in phase" with the voltage source. What is $i(t)$?



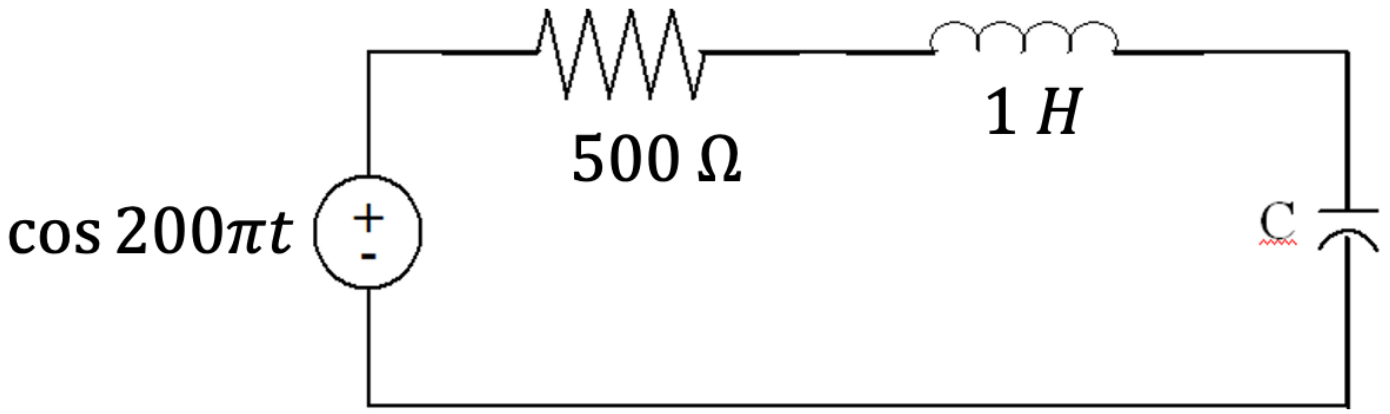
$0.8\ H, 20\cos(10{,}000t)\ mA;\ 0.2\ H, 405\cos(10{,}000t)\ mA$

Practice problem: find the inductor value so that the current i is "in phase" with the voltage source. What is $i(t)$?



$0.8\ H, 20\cos(10{,}000t)\ mA;\ 0.2\ H, 405\cos(10{,}000t)\ mA$

Practice problem: find the capacitor value to maximize the magnitude of the voltage appearing across the capacitor. What is that magnitude?



$1.55\ \mu F, 1.61\ V$