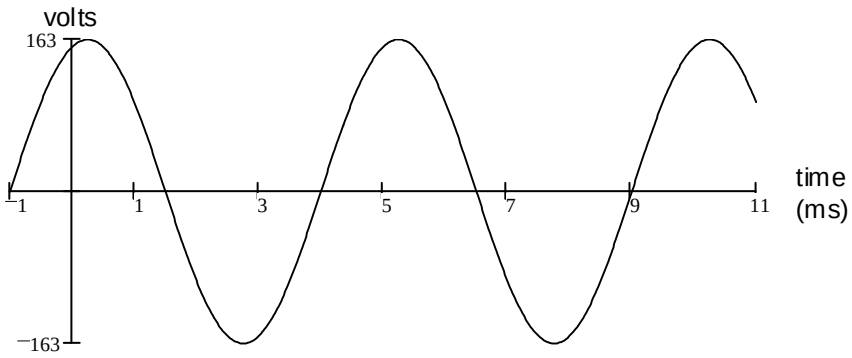
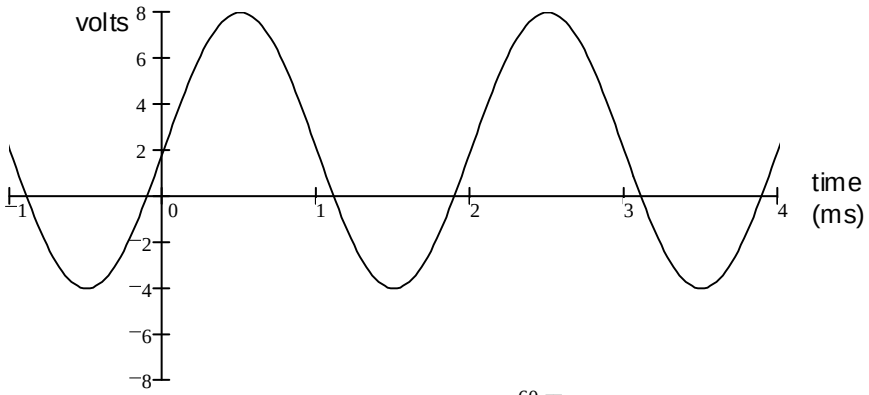
ECE 3600 Homework # 2 **Due: Fri, 9/4/09** b

1. For each of the following waveforms, find:
   1) Average DC (V_{DC}, or I_{DC}) value
   2) RMS (effective) value

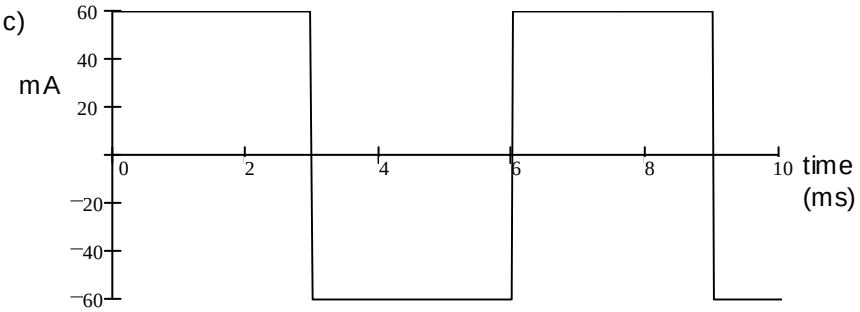
1a)



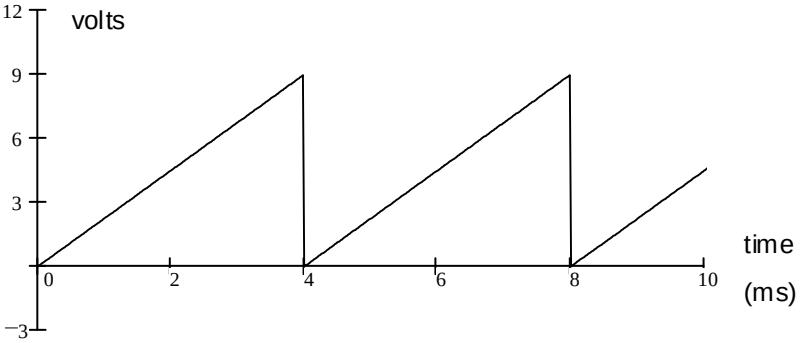
b)



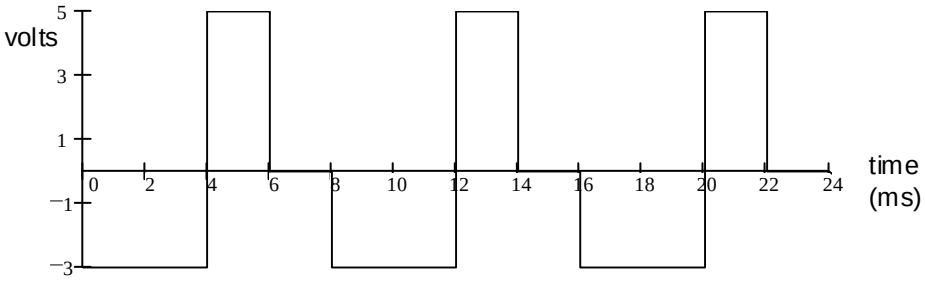
c)



d)



2. For waveform shown, find:
   a) Rectified average (V_{RA}) value
   b) RMS (effective) value



3. Compute the power factor for an inductive load consisting of $L := 20\cdot mH$ and $R := 6\cdot\Omega$ in series. $\omega := 377\cdot\frac{rad}{s}$

4. The complex power consumed by a load is $620\ \underline{/29^o}\ VA$. Find:

   a) Apparent power (as always, give the correct units). b) Real power. c) Reactive power.

   d) Power factor. e) Is the power factor leading or lagging? f) Draw a phasor diagram.

5. In the circuit shown, the voltmeter measures $120V$ and the ammeter measures $6.3A$ (recall that AC meters read RMS). The wattmeter measures $560W$. The load consists of a resistor and an inductor. The frequency is $60Hz$. Find the following:

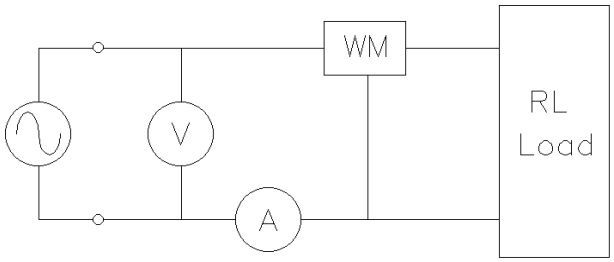
   a) Power factor b) Leading or lagging?

   c) Real power.

   d) Apparent power.

   e) Reactive power.

   f) Draw a phasor diagram.



   g) The load is in a box which cannot be opened. Add another component to the circuit above to correct the power factor (make $pf = 1$). Draw the correct component in the correct place and find its value. This component should not affect the real power consumption of the load.

6. For the circuit shown, find the following: (as always, give the correct units)

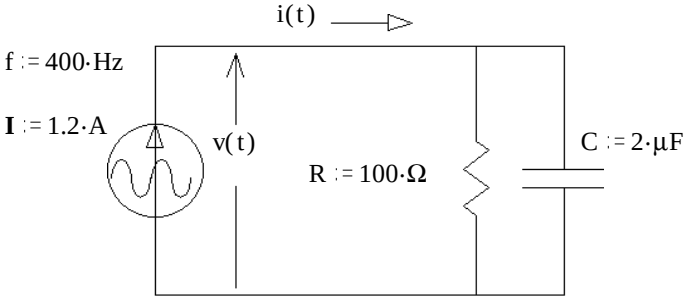
   a) The complex power.

   b) Real power.

   c) Reactive power.

   d) Apparent power.

   e) Draw a power phasor diagram.



Answers

1. a) $0\cdot V$ $115\cdot V$ b) $2\cdot V$ $4.69\cdot V$ c) $0\cdot mA$ $60\cdot mA$ d) $4.5\cdot V$ $5.2\cdot V$

2. a) $2.75\cdot V$ b) $3.28\cdot V$

3. $pf := 0.623$

4. a) $620\cdot VA$

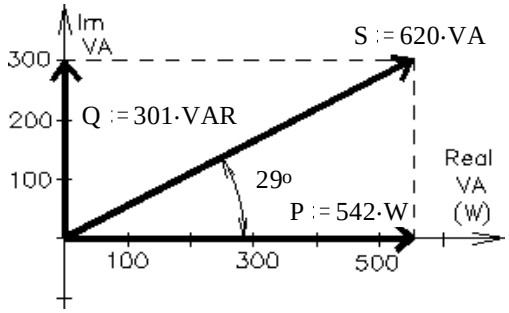
   b) $542\cdot W$

   c) $301\cdot VAR$

   d) 0.875

   e) lagging

   f) ------->



5. a) 0.741

   b) lagging

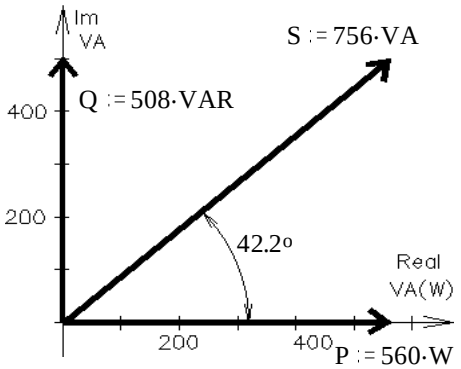
   c) $560\cdot W$

   d) $756\cdot VA$

   e) $508\cdot VAR$

   f) ------->

   g) $93.6\cdot\mu F$ capacitor in parallel with load



6. a) $(115 - 57.8\cdot j)\cdot VA$

   b) $115\cdot W$

   c) $-57.8\cdot VAR$

   d) $128.7\cdot VA$

   e) ------->