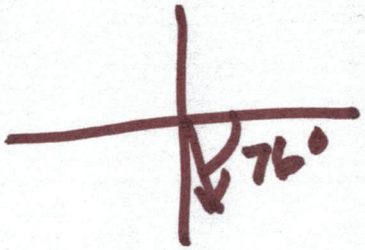
EE 221 Circuits II

Feb. 22, 2021

Lecture 9

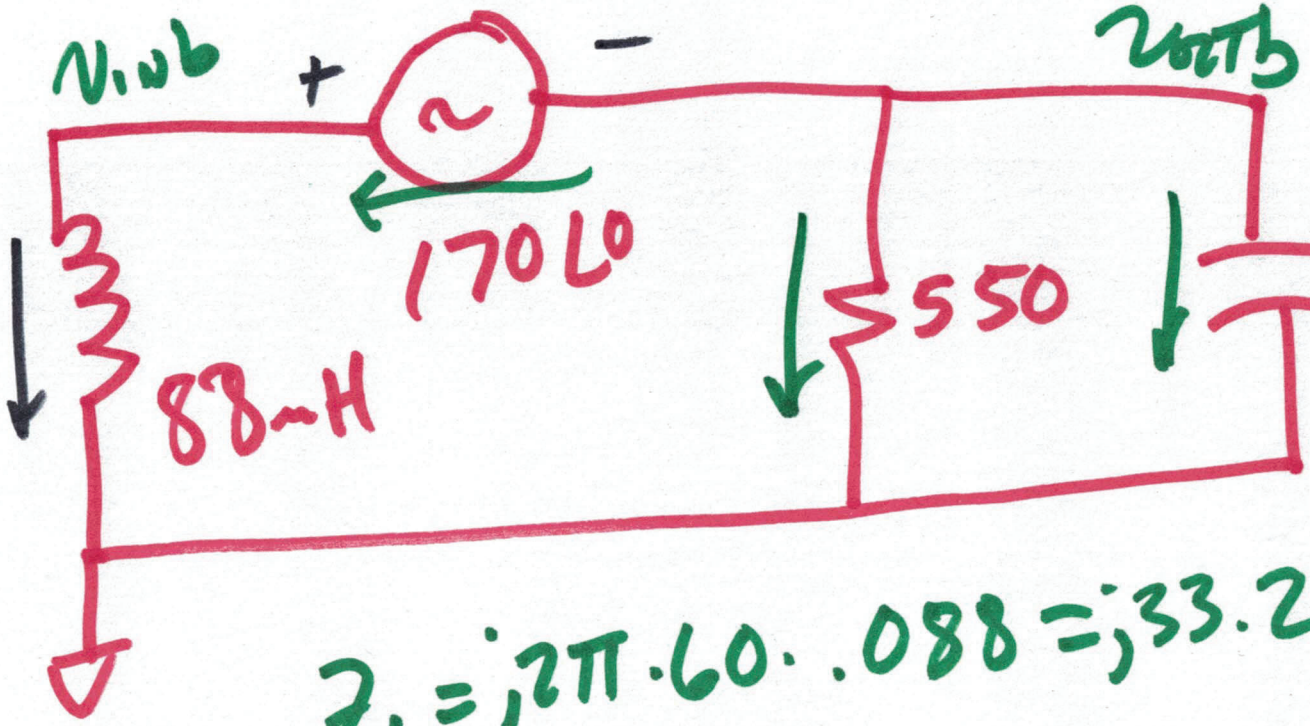


$$170\angle 0 \cdot \frac{500}{j33.1 + 129\angle -76}$$

$$Re = 129\cos(-76) = 31.2$$

$$Im = 129\sin(-76) = -125.2$$

$$\frac{170\angle 0 \cdot 500\angle 0}{31.2 + j(-125.2 + 33.1)}$$

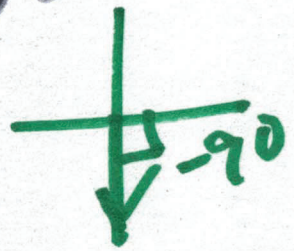


$$\frac{a-b}{c} = \frac{a}{c} - \frac{b}{c}$$

$$Z_L = j2\pi \cdot 60 \cdot .088 = j33.2$$

$$Z_C = -j\frac{1}{2\pi \cdot 60 \cdot 20\mu} = -j132.6$$

$$0 = \frac{V_{nb}}{j33.2} + \frac{V_{nb} - 170\angle 0}{550} + \frac{V_{nb} - 170\angle 0}{-j132.6}$$



$$0 = V_{inb}\left(\frac{1-j(0.03)}{j33.2} + \frac{1}{550} + \frac{1+j.001818}{-j132.6}\right) - \frac{170\angle 0}{550\angle 0} - \frac{170\angle 0}{132.6\angle -90}$$

Mistake

$$V_{inb}\cdot 10^{-3}\left(1.818 - j(22.46)\right)$$

$$-.31\angle 0 - 1.29\angle 90$$

$$-.31 + j0 \quad -j1.29$$

$$V_{inb} = -.3 - j1.26$$

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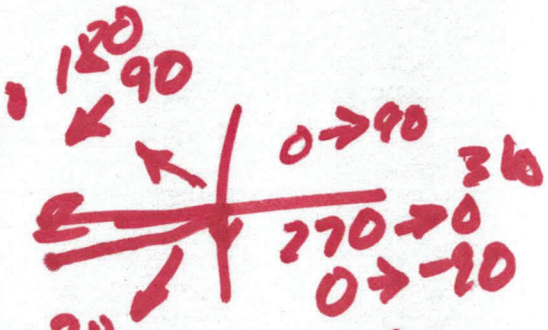
$V_{inb} = 1.3 \angle -104$

$V_{outb} = V_{inb} - 170\angle 0°$



$= V_{inb} - 170$

$V_{outb} = -170.3 - j1.26$

$V_{outb} = 170.3 \angle 180°$

$$v_{inb} = 1.3\sin(2\pi \cdot 60 \cdot t - 104)$$

$$v_{outb} = 170.3^{5.2}(2\pi \cdot 60 \cdot t + 180)$$

$$T = 16.667\text{ms} \qquad t_d = 8.3\text{ms}$$

~~$v_{outb} = 170.3$~~

$v_{inb} \rightarrow$

$$360 \cdot \frac{\Delta t}{16.67} = 104$$

$$t_d = 4.81\text{ms}$$

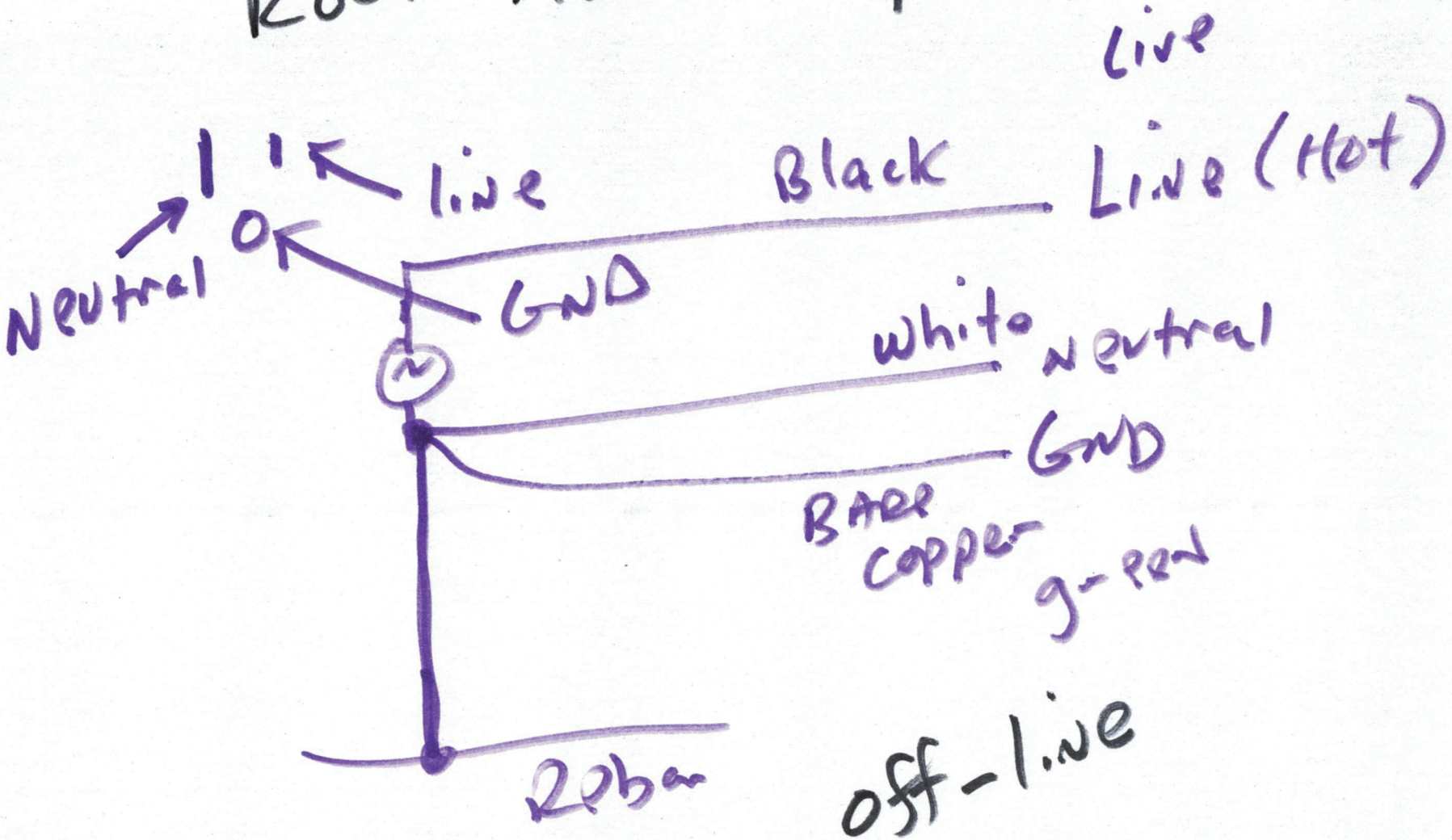
$$0 = V_{inb} \cdot 10^{-3}\left(-j\frac{30}{3}\right) + 1.81 + j7.5) + \frac{-170\angle 0^\circ}{5502^\circ} + \frac{170\angle 0^\circ}{132.6\angle 90^\circ}$$

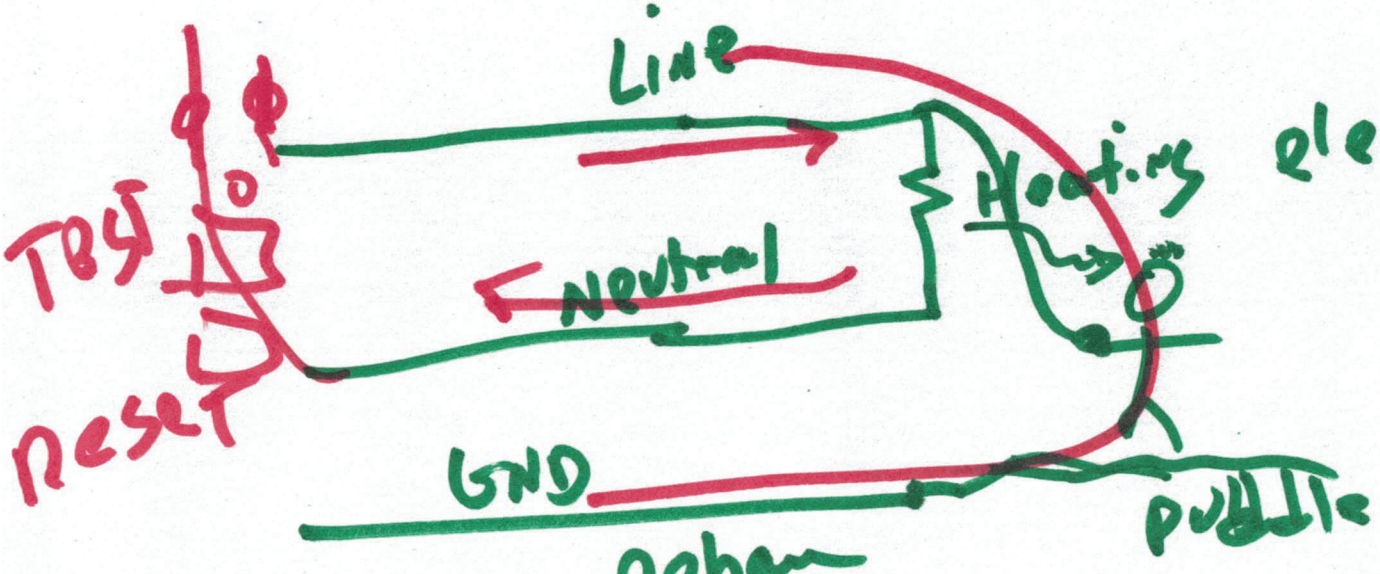
$$= V_{inb} \cdot 10^{-3}(1.81 + j4.5) + -.31 + 1.25$$

$$V_{inb} = \frac{+ -.31 + j1.25}{.31 - j1.25} \cdot 10^3$$

$$= \frac{10^3 \; 1.28\angle -76^\circ}{4.8\angle 68} =$$

Root Mean Square





GFCI Interrupter Circuit

Ground fault

170

$120 = \frac{V_p}{\sqrt{2}}$

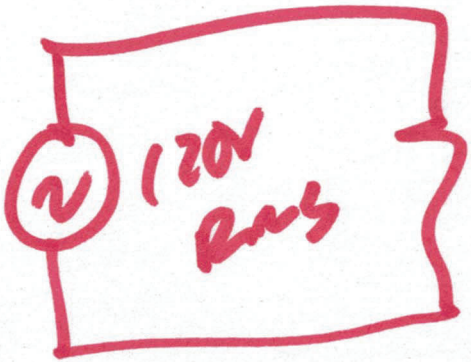
170

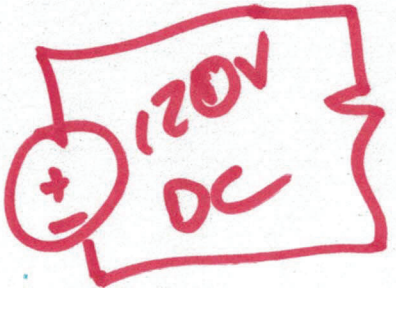
120V Rms

114

170

340V PP





instantenous power

$$p(t) = v(t) \cdot i(t) \sim$$

$$i = C\frac{dv}{dt}$$

$$v = L\frac{di}{dt}$$

$$P_{AVG} = \frac{1}{T}\int_0^T p(t)\,dt$$

APPARENT $P \equiv I_{rms} \cdot V_{rms}$