Complex numbers 005

Problem has been graded.

Hint: Solve this symbolically as much as you can and only plug in numbers at the very end.

Find P and Q.

Note: We've used bold capital letters to denote complex variables. The * operator stands for complex conjugate. The Re[] and Im[] operators stand for taking the real part and imaginary part respectively.

Solve without a calculator

$$\mathbf{V_1} = be^{j\frac{\pi}{3}} \qquad \mathbf{Z_1} = a - aj \qquad \mathbf{I_1} = \frac{\mathbf{V_1}}{\mathbf{Z_1}}$$

$$\mathbf{S} = \frac{1}{2} \cdot \mathbf{V_1} \cdot \mathbf{I_1^*} \qquad P = \mathrm{Re}[\mathbf{S}] \qquad Q = \mathrm{Im}[\mathbf{S}]$$

Given Variables:

a : 1 .

b : 2 .

Calculate the following:

P (.) :

1 ✓

Q (.) :

-1 ✓

Hint: Work this out symbolically first and only plug in numbers later.

Find P and Q.

a : 2 .

b : 4 .

Note: We've used bold capital letters to denote complex variables. The * operator stands for complex conjugate. The Re[] and Im[] operators stand for taking the real part and imaginary part respectively.

$$\mathbf{V_1} = be^{j\frac{\pi}{3}} \qquad \mathbf{Z_1} = a - aj \qquad \mathbf{I_1} = \frac{\mathbf{V_1}}{\mathbf{Z_1}}$$

$$\mathbf{S} = \frac{1}{2} \cdot \mathbf{V_1} \cdot \mathbf{I_1^*} \qquad P = \mathrm{Re}[\mathbf{S}] \qquad Q = \mathrm{Im}[\mathbf{S}]$$

$$S = \frac{1}{2} V_1 I_1^* = \frac{1}{2} V_1 \frac{V_1^*}{Z_1^*} = \frac{1}{2} \frac{|V_1|^2}{Z_1^*}$$

$$S = \frac{1}{2} \cdot \frac{4^2}{2+2j} = \frac{4^2}{2 \cdot 2} \frac{1}{1+j} \frac{1-j}{1-j} = 4 \left(\frac{1-j}{i+1}\right) = 2(1-j)$$

$\boxed{P = 2}$

$\boxed{Q = -2}$