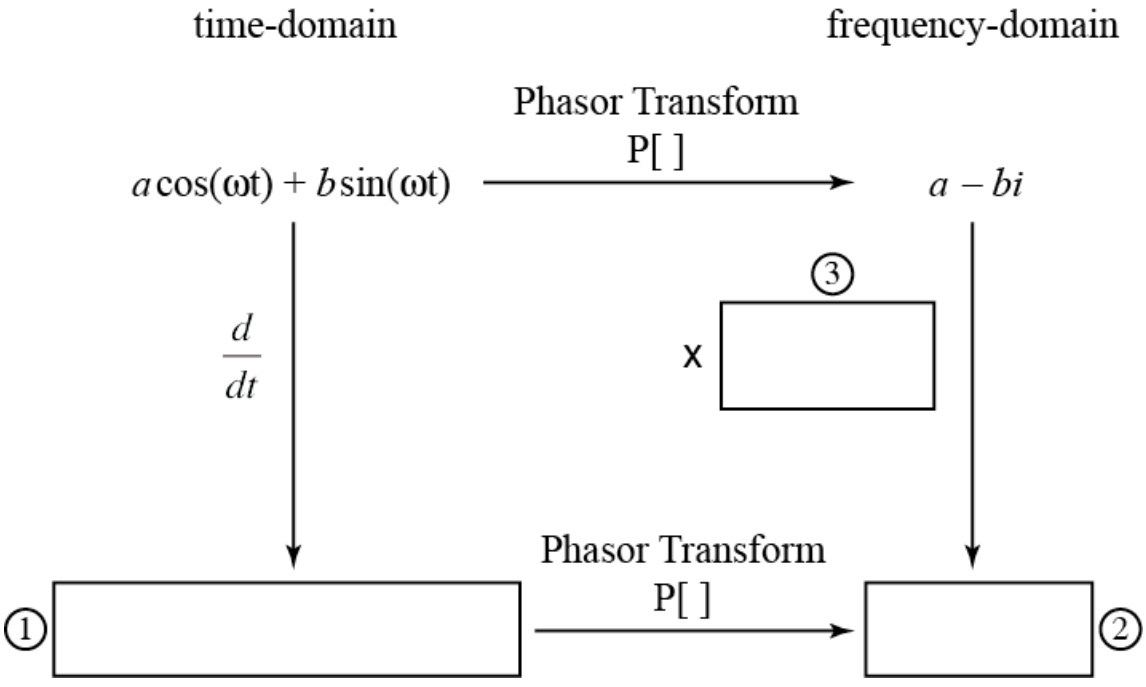
By: Neil E. Cotter

YOUR NAME(S): _____

PROB: Phasors transform differentiation of sinusoids into multiplication. In other words, the phasor of the derivative of a sinusoid is the phasor of the sinusoid (before taking the derivative) multiplied by a numerical quantity. By completing the diagram below, determine what that quantity is. Fill in box 1, then 2, then 3. (The final answer you are looking for goes in box 3 next to the vertical arrow on the right.)

Note that the arrows in the diagram represent operations being performed on the expression at the beginning of the arrow, with the operation being shown next to the arrow. The result of the operation is shown at the end of the arrow.

Thus, the lower left-hand box 1 contains the time derivative of the upper left-hand box. Use calculus (and the chain rule) to computer the derivative. Then, take the phasor transform of the derivative to get a complex number that goes in the lower-right box 2. You will discover that this phasor in the lower-right is equal to $a - bi$ times a certain quantity. Put that quantity in box 3 to complete the diagram.



Takeaway: Differentiating a sinusoid is equivalent to multiplying its phasor by a known quantity (in box 3).