Student Name: _____ Due: Monday, 8/13/2014

Take-home Quiz 1 - The Eternal Wrapping Spring of Sin and Cosine Fun!

This activity will require some thought. Do not feel bad if you do not understand everything right away! You may use calculators and receive help from classmates, tutors, or me.Answers to "What did you notice and what do you think?" questions should be *thorough* and *thoughtful*. If your answer uses only a small part of the space provided, it is probably not thorough!

Part 1 (7 points) Let's start by exploring translations and phase shifts of $cos(x)$. Fill in the table using the unit circle, plotting the functions in the spaces provided as you go. Be sure to check your work with a calculator or computer. Remember that your calculator has a table you can use to check your work.

This may look like a *lot* of work, but you will *not actually need to check every single point* on the unit circle (unless you would like to!). As you go, you will begin to notice behavior patterns which involve the phase shift, period, and amplitude of the functions which will help you to quickly complete the graphs and fill in the table. The graphs are on the following page. Be sure to fill out the graphs *as* you are filling out the table! It will help you to see the patterns which make the activity go faster. It will be very fun!

	-3π	-2.5π	-2π	-1.5π	$-\pi$	$-.5\pi$	0	$.5\pi$	π	1.5π	2π	2.5π	3π
$cos(x)$													
$2cos(x)$													
$cos(2x)$													
$2cos(2x)$													
$cos(x-\frac{\pi}{2})$													
$2cos(2(x-\frac{\pi}{2}))$													
$2cos(2x-\frac{\pi}{2})$													

	Amplitude	Period	Describe Phase Shift (if any)
$cos(x)$			
$2cos(x)$			
$cos(2x)$			
$2cos(2x)$			
$cos(x-\frac{\pi}{2})$			
$2cos(2(x-\frac{\pi}{2}))$			
$2cos(2x-\frac{\pi}{2})$			

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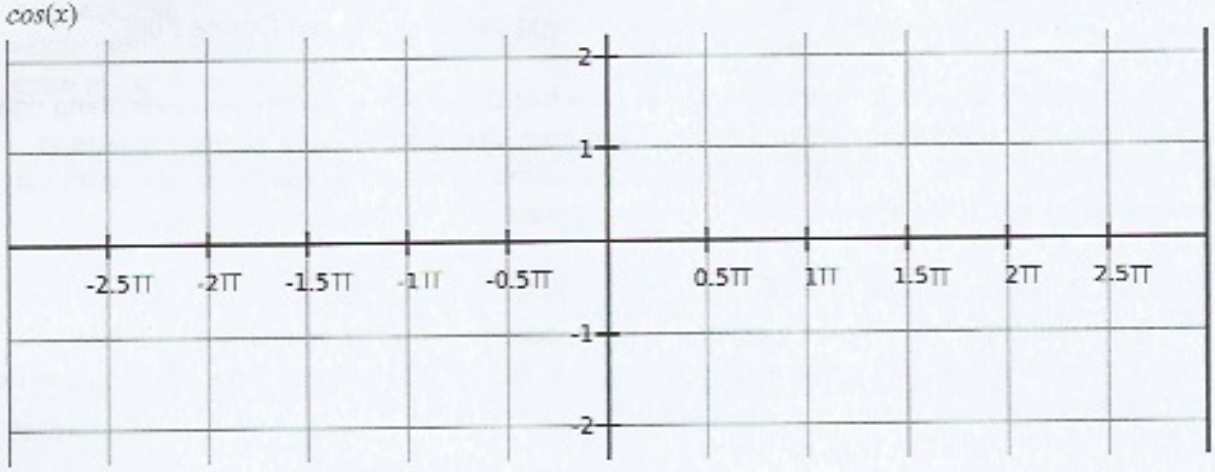
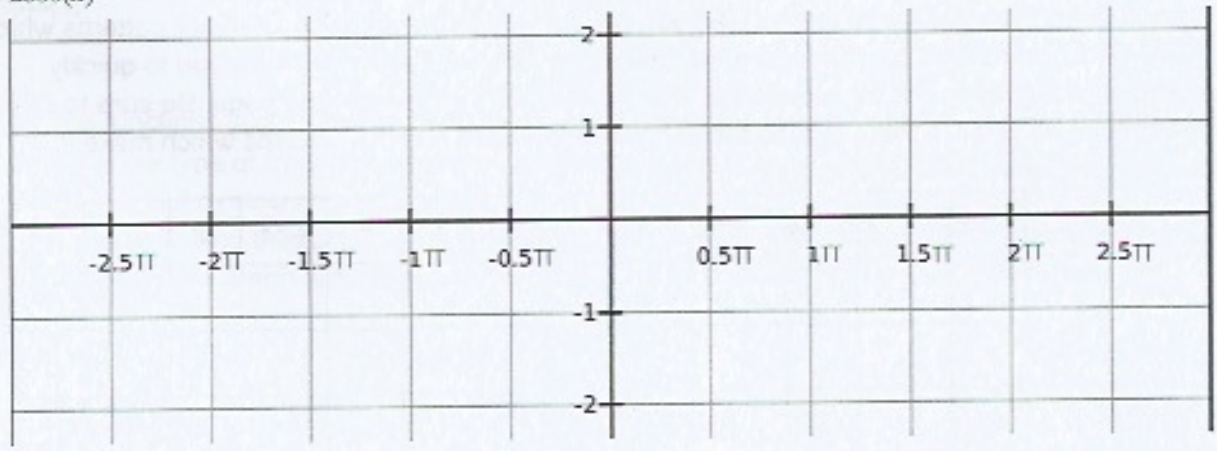
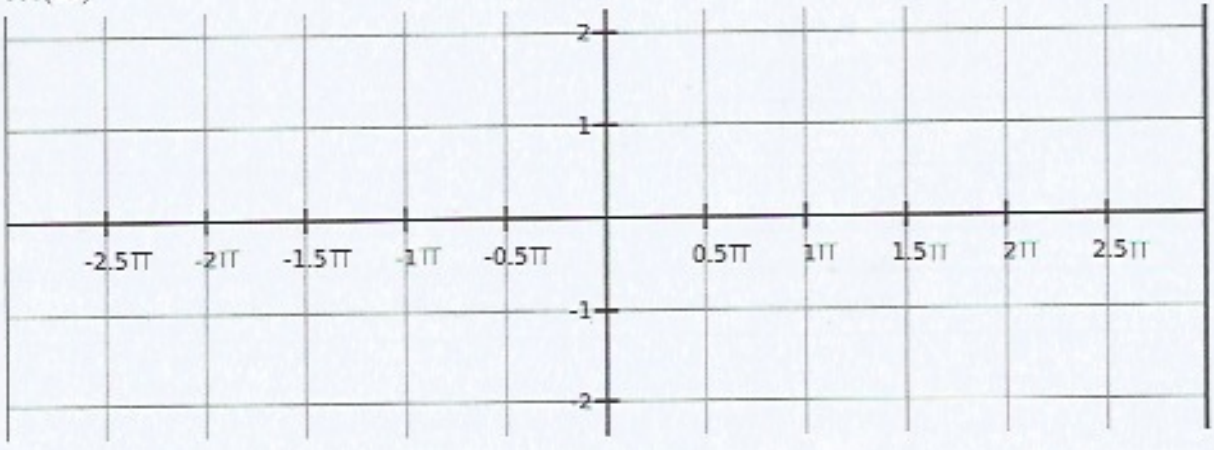
$cos(x)$



$2cos(x)$



$cos(2x)$



$2cos(2x)$

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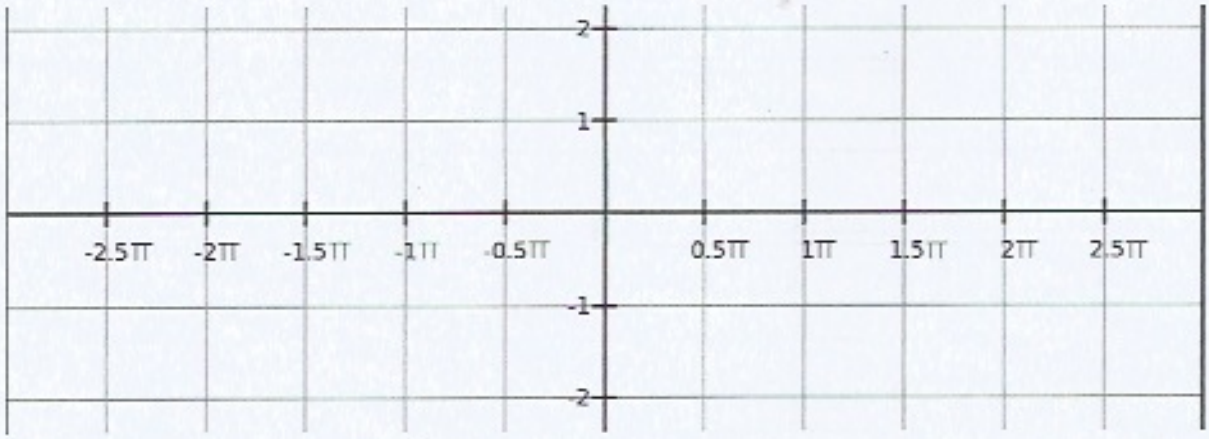
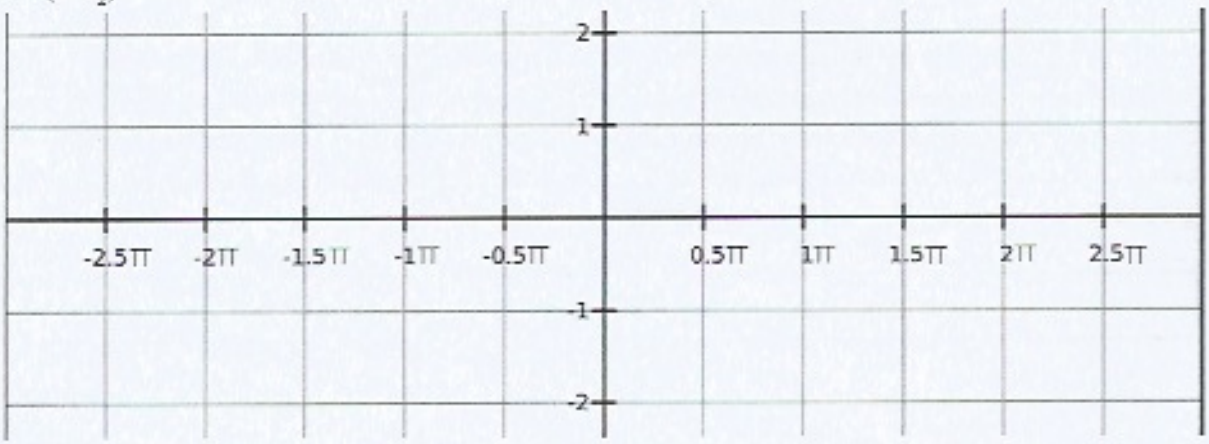
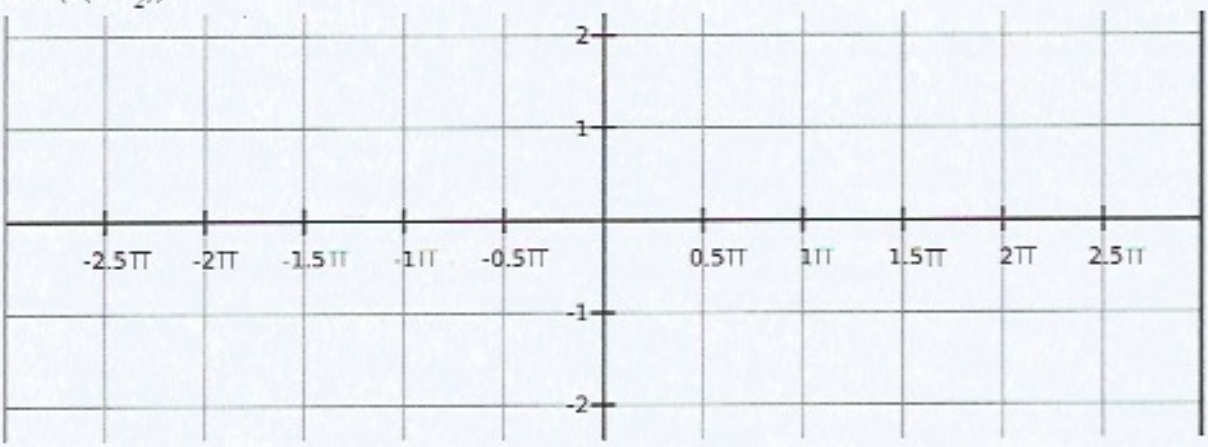


$cos(x-\frac{\pi}{2})$



$2cos(2(x-\frac{\pi}{2}))$



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$2cos(2x-\frac{\pi}{2})$

Part 2 (4 points) Let's continue our fun by exploring translations and phase shifts of $sin(x)$. Fill in the table using the unit circle, plotting the functions in the spaces provided as you go. Be sure to check your work with a calculator or computer. Remember that your calculator has a table you can use to check your work. Again, you will notice patterns that allow you to fill in the table and graphs and complete your work more quickly.

	-3π	-2.5π	-2π	-1.5π	$-\pi$	$-.5\pi$	0	$.5\pi$	π	1.5π	2π	2.5π	3π
$sin(x)$													
$\frac{1}{2}sin(x)$													
$sin(\frac{1}{2}x)$													
$sin(x+\frac{\pi}{2})$													

The graphs are on the following page. Be sure to fill out the graphs *as* you are filling out the table! It will help you to see the patterns which make the activity go faster.

	Amplitude	Period	Describe Phase Shift (if any)
$sin(x)$			
$\frac{1}{2}sin(x)$			
$sin(\frac{1}{2}x)$			
$sin(x+\frac{\pi}{2})$			

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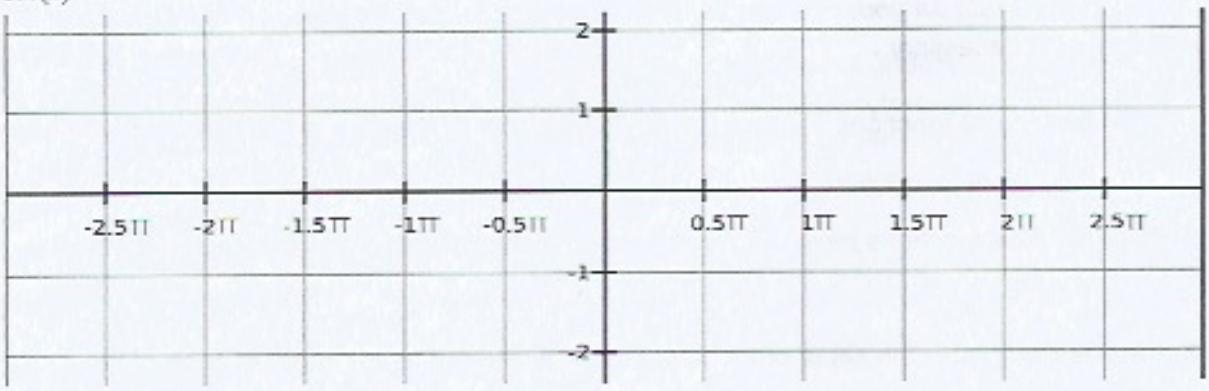
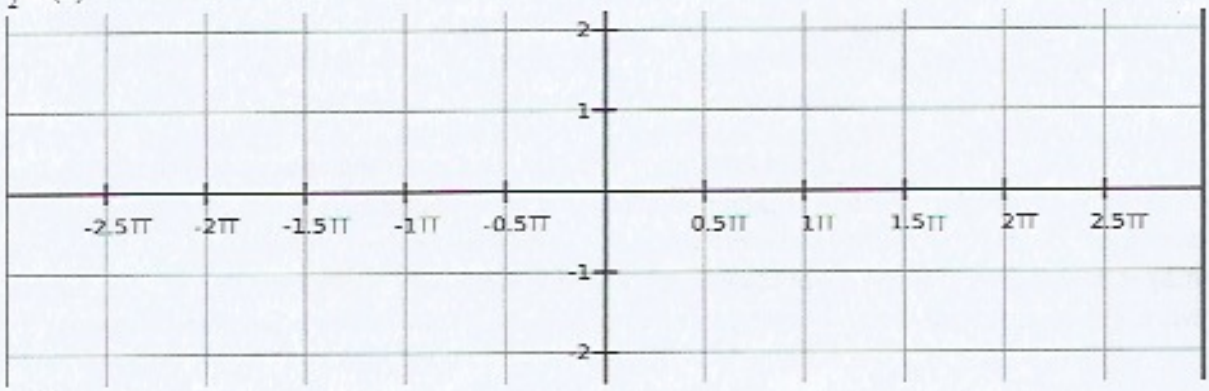
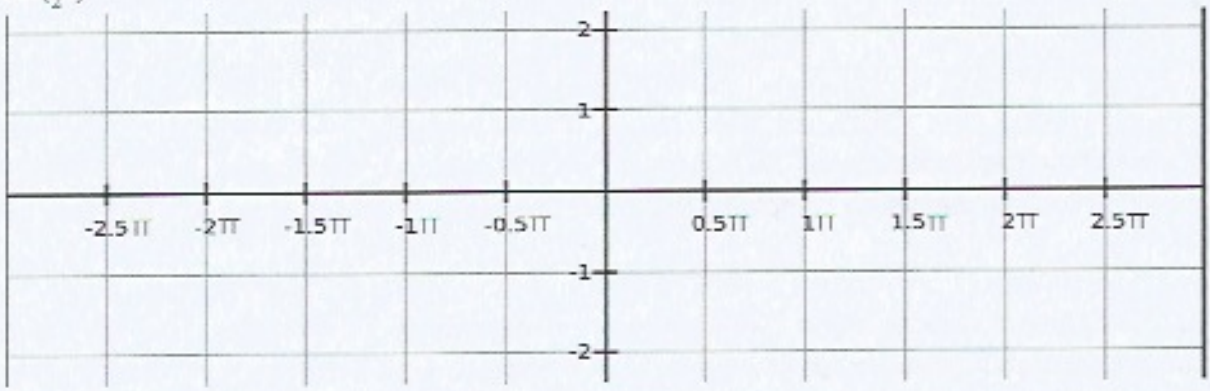
$sin(x)$



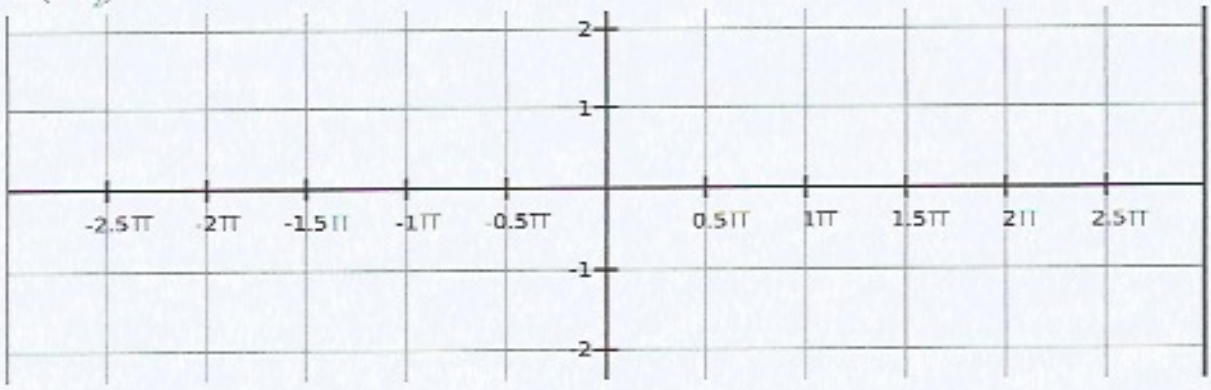
$\frac{1}{2}sin(x)$



$sin(\frac{1}{2}x)$



$sin(x + \frac{\pi}{2})$



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Part 3 (7 Points) Answers to #4 and #7 should involve at least several complete sentences which *demonstrate an understanding of the answer to the question being asked.* You may attach extra paper if necessary.

1) All of our cosine functions have the same domain (set of possible inputs). What is it?

2) All of our sine functions have the same domain (set of possible inputs). What is it?

3) What is the image (the set of outputs, sometimes referred to as range) of each of the following functions?

$sin(x)$ $cos(x)$ $2cos(2x-\frac{\pi}{2})$ $\frac{1}{2}sin(x)$

4) The functions $f(x)=2cos(2x-\frac{\pi}{2})$ and $f(x)=2cos(2(x-\frac{\pi}{2}))$ are translations of each other. Classify the type of translation (scaling amplitude, scaling period frequency, phase shift, etc.) and figure out by how much (a number) they have been translated (shifted, scaled, etc.). This may require some thought. I would encourage you to work with another class member. Show all work. (Hint: see graph and maybe try to rewrite the formula for $f(x)$ to look more like $g(x)$)

5) One of the translations of the $sin(x)$ function actually gave you the function $cos(x)$. Which one was it? (Hint: you can tell by comparing the graph of $cos(x)$ to those of your $sin(x)$ translations!)

6) One of the translations of the $cos(x)$ function actually gave you the function $sin(x)$. Which one was it? (Hint: you can solve this in a similar way to how you solved #5!)

7) Relate your answers from #5 and #6 to what we know from the unit circle. Why are your answers from #5 and #6 *exactly* what we would logically expect to see?