Math 27 **Graphs of $y = a\sin(bx - c)$ and $y = a\cos(bx - c)$** §4.5 – day 2

Definitions:

Recall that when the graph of a function is moved either to the right or to the left, we say that it has been translated horizontally. The amount of the translation is called the **horizontal shift**.

For the trigonometric functions, this is known as the **Phase Shift.**

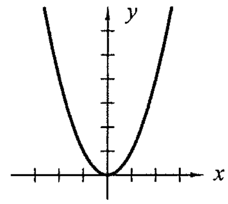


Figure 1: $y = x^2$

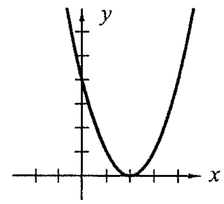
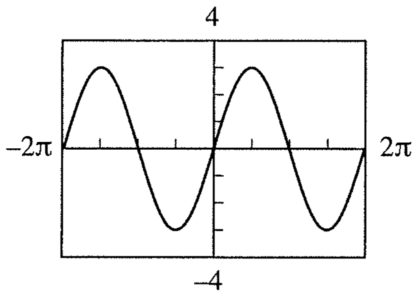


Figure 2: $y = (x-2)^2$

Examples: Consider the graphs of the following functions. Determine the phase shift for each one.

1. $y = 3\sin x$ $c =$



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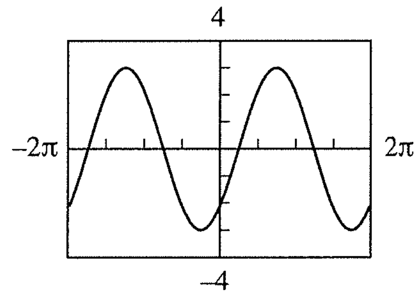
2. $y = 3\sin(x - \pi/4)$ $c =$



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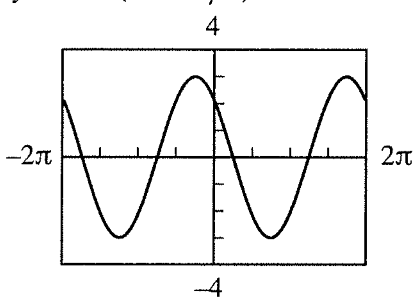
3. $y = 3\sin(x + 3\pi/4)$ $c =$



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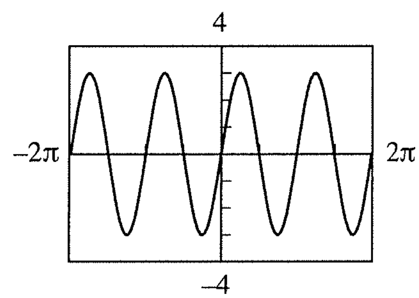
4. $y = 3\sin 2x$ $c =$



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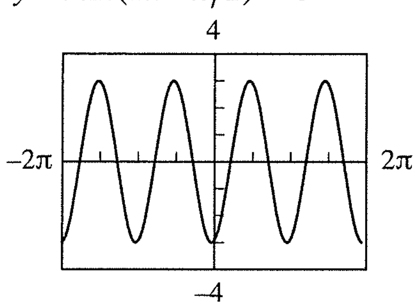
5. $y = 3\sin(2x - \pi/2)$ $c =$



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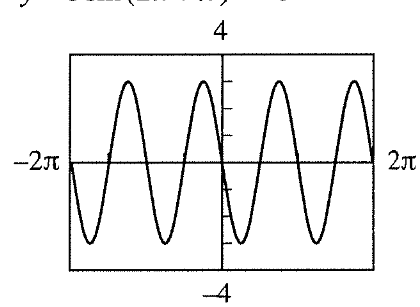
6. $y = 3\sin(2x + \pi)$ $c =$



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Observation: For the graphs of $y = a\sin(bx - c)$ and $y = a\cos(bx - c)$ the phase shift equals:

Procedure for sketching the graphs of $y = a\sin(bx - c)$ and $y = a\cos(bx - c)$.

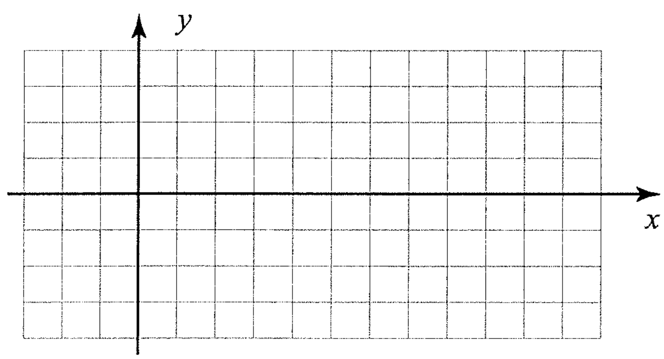
Step 1 Find the amplitude: $|a|$ and the period $2\pi/b$. Draw the ceiling and the floor.

Step 2 Solve $bx - c = 0$. Now, $x = c/b$ is the left wall (Phase Shift). Draw the left wall. Then $x = c/b + 2\pi/b$ is the right wall.

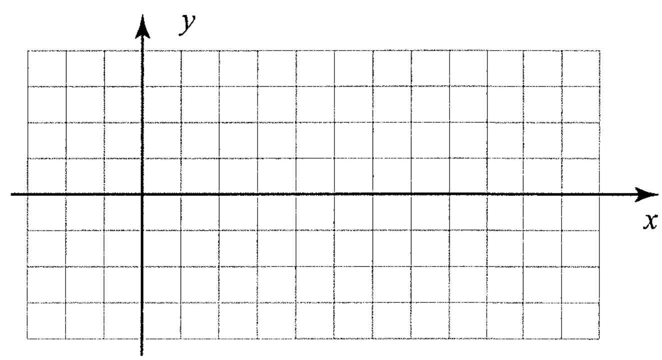
Step 3 Divide the period into quarter points and sketch one cycle in the frame.

Exercise: Sketch the graphs of one period of the following functions on the coordinate system provided.

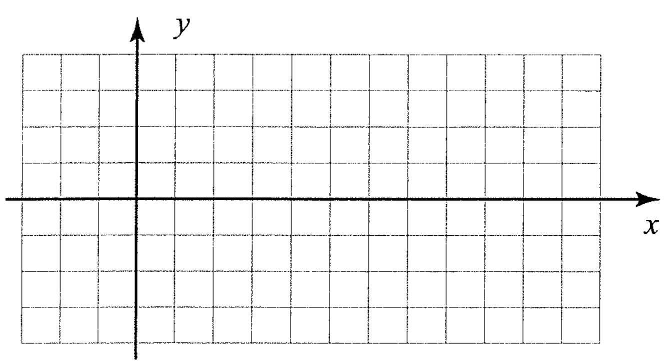
1. $y = 2\sin(x + \pi/4)$



2. $y = 3\cos(x - \pi/2)$



3. $y = -3\sin(\pi x + \pi/2)$



4. $y = 2\cos(\pi x/2 - \pi/4) + 1$