Investigating the Properties of Sinusoidal Functions

Open Desmos.

If there are any functions already present, push the settings button  then delete all.

Click the wrench button  and under Trig Settings, choose the second option for x-axis labels. The button shows $\pi, 2\pi, 3\pi$. This will display our graph in "radians".

Graph the function $f(x) = \sin x$ by clicking in the first function box, typing "y =", clicking the "functions" button, selecting sin, then click "x".

You can zoom in and out along **either** axis in the program. Zoom your y-axis so it runs between -2 and 2. Zoom your x-axis until you see two full cycles of your function.

1. Compare your graph of the sine function with one we have done previously. What does π seem to represent?

   180°

2. Yesterday I mentioned that the equation for the circumference of a circle is $C = 2\pi r$. Explain why this makes sense in light of your answer to question 1.

   Because $2\pi = 360°$ and there are 360° in a circle.

3. Graph the function $\boldsymbol{f(x) = 4\sin(3x) + 2}$ and fill in the blanks below.

   - The period is 120° (1/3 of sin x)
   - The equation of the axis is y = 2
   - The amplitude is 4
     - The max value is 6
     - The min value is -2
   - The domain is { x ∈ ℝ }
   - The range is { -2 ≤ y ≤ 6 }
   - The zeroes are located at 70°, 110°, 190°, 230°, . .

4. Compare your answers to question 3 with the results of our minds on.
   Explain what effect each value in the equation of question 3 (4, 3 and 2) had on the original graph of sin x. Be specific and use key terms from the unit.

The 3 is changing the period $\frac{360}{3}$
The 4 is stretching the curve (changing the amplitude)
The 2 is shifting the curve up by 2 (changing the equation of the axis)

5. Delete all functions.
   Graph $f(x) = \cos x$ and $\boldsymbol{f(x) = \frac{1}{2}\cos(-2x) - 4}$. Fill in the blanks below

- The period is 180° ($\frac{360}{2}$)
- The equation of the axis is $y = -4$
- The amplitude is 0.5
  - The max value is -3.5
  - The min value is -4.5
- The domain is { $x \in \mathbb{R}$ }
- The range is { $-4.5 \leq y \leq -3.5$ }
- The zeroes are located at N/A

6. Revisit your answer to question 4.
   Do you still agree with what you said? Why or why not?

yep !!

7. Explain what effect each value in the function equation above had on the original graph of cos x. Be specific and use key terms from the unit.

The 1/2 compressed the graph (amplitude is 0.5/$\frac{1}{2}$)
The -2 changed the period ⇒ $\frac{360}{2} = 180$, also reflected about y-axis (no effect)
The -4 shifted the curve down (equation: y=-4)