Name ________________________

Class ________________________

Problem 1 – Exploring $y = a \cdot \sin(x)$

On page 1.3, **f1**(*x*) = sin(*x*) is graphed on the left.
Change the function definition of **f2** on the right to read: **f2**(*x*) = 3·**f1**(*x*).

- Were there any changes in the period or amplitude? To determine the exact changes, drag the point on **f2**(*x*).

- Experiment with other values of *a*, and summarize your results here.

- Try using a few negative values. What do you notice?

Problem 2 – Exploring $y = \sin(x) + a$

On page 2.2, **f1**(*x*) = sin(*x*) is graphed on the left.
Change the function definition of **f2** on the right to read: **f2**(*x*) = **f1**(*x*) + 4.

- Were there any changes in the period or amplitude?

- What would happen if you changed **f2** to **f2**(*x*) = **f1**(*x*) – 4?
  Graph this function to confirm your answer.

- Experiment with other values and summarize your results here.

Problem 3 – Exploring $y = \sin(x - a)$

On page 3.2, **f1**(x) = sin(x) is graphed on the left.
Change the function definition of **f2** on the right to read: **f2**(x) = **f1**(x – 1).

- Were there any changes in the period or amplitude?

- What would happen if you changed **f2** to **f2**(x) = **f1**(x + 1)?
  Graph this function to confirm your answer.

- Experiment with other values and summarize your results here.

Problem 4 – Exploring $y = \sin(a \cdot x)$

On page 4.2, **f1**(x) = sin(x) is graphed on the left.
Change the function definition of **f2** on the right to read: **f2**(x) = **f1**(2x).

- Were there any changes in the period or amplitude?

- Experiment with other values and summarize your results here.

Problem 5 – Putting it all together

- Based upon the previous four problems, predict the transformations $y = \sin(x)$ must undergo to be transformed into $y = \sin(2x + 6)$.
  On page 5.2, graph the function **f2**(x) = sin(2x + 6) on the right to check.

While your prediction for the period is most likely correct, your prediction for the horizontal shift is most likely incorrect. To refine the techniques used in this activity, we must ensure that the coefficient of x is always 1. To accomplish this, factoring is required as shown below.

$$\mathbf{f2}(x) = \mathbf{f1}(2x + 6)$$
$$\mathbf{f2}(x) = \mathbf{f1}(2(x + 3))$$

Now the prediction for the horizontal shift is clearly –3, and it matches the graph.

- Knowing what you now know, predict the transformations $y = \sin(x)$ must undergo to be transformed into $y = 2\cdot\sin(3x + 6)$. Check your results using page 5.2.

Extension

Describe the transformation(s) the graph of $f(x) = \sin(x)$ must undergo to obtain the graph of each of the functions below.

1. $f(x) = \sin(x - 4)$
2. $f(x) = -2\sin(x)$
3. $f(x) = \sin(4x + 12) + 3$
4. $f(x) = 3\sin(2x) - 8$