***3.9: Introduction***

***Transformations of Sine and Cosine***

1. Open the Desmos Program below. When you open the window you should see the graph of f(x) = sin(x). Remember that 3.14 is approximately and 6.28 is approximately .

<https://www.desmos.com/calculator/zcvoa3l2nk>

2. In this exploration activity you will be investigating how the four sliders (a, b, c, and d) change the sine function.

3. Drag the slider for **a** to the values listed below and describe how the graph of the function changes. Use the appropriate vocabulary.

**a = 2**

f(x) = 2sin(x)

**a = 3**

f(x) = 3sin(x)

**a = 4.5**

**a = -1**

f(x) = -sin(x)

**Move *a* back to 1 before going to the next section**

4. Drag the slider for **b** to the values listed below and describe how the graph of the function changes. Specifically, how many waves occur on the interval ? What does this change. Use the appropriate vocabulary.

**b = 2**

f(x)= sin(2x)

**b = 3**

f(x) = sin(3x)

**b = 4**

f(x) = sin(4x)

**b = ½**

**b = 1/4**

**Move *b* back to 1 before going to the next section**

5. Drag the slider for **c** to the values listed below and describe how the graph of the function changes.

**c =**

**c = -**

**c =**

**c = -2**

\*Does it appear that the graph changes at all?\* Can you make any generalizations?

**Move *c* back to 0 before going to the next section**

6. Drag the slider for **d** to the values listed below and describe how the graph of the function changes.

**d = 1**

f(x) = sin(x) + 1

**d = - 4**

f(x) = sin(x) – 4

**Move *d* back to 0 before going to the next section**

7. What generalizations can you make about what each variable does to the graph of the sine function?



What do you think the graphs below will look like? Use the desmos to change the sliders to match the function and compare.

f(x) = 4sin(2x) f(x) = -3sin(x) – 2

8. Open the Desmos Program below. When you open the window you should see the graph of f(x) = cos(x). Remember that 3.14 is approximately and 6.28 is approximately .

<https://www.desmos.com/calculator/0jgaxbkgo5>

9. In this exploration activity you will be investigating how the four sliders (a, b, c, and d) change the sine function.

10. Drag the slider for **a** to the values listed below and describe how the graph of the function changes. Use the appropriate vocabulary.

**a = 2**

f(x) = 2cos(x)

**a = 3**

f(x) = 3cos(x)

**a = 1.5**

**a = -4**

f(x) = -4cos(x)

**Move *a* back to 1 before going to the next section**

11. Drag the slider for **b** to the values listed below and describe how the graph of the function changes. Specifically, how many waves occur on the interval ? What does this change. Use the appropriate vocabulary.

**b = 2**

f(x)= cos(2x)

**b = 3**

f(x) = cos(3x)

**b = 4**

f(x) = cos(4x)

**b = ½**

**b = 3/4**

**Move *b* back to 1 before going to the next section**

12. Drag the slider for **c** to the values listed below and describe how the graph of the function changes.

**c =**

**c = -**

**c =**

**c = -2**

\*Does it appear that the graph changes at all?\* Can you make any generalizations?

**Move *c* back to 0 before going to the next section**

13. Drag the slider for **d** to the values listed below and describe how the graph of the function changes.

**d = 3**

f(x) = cos(x) + 3

**d = - 2**

f(x) = sin(x) – 2

**Move *d* back to 0 before going to the next section**

14. What generalizations can you make about what each variable does to the graph of the cosine function?



What do you think the graphs below will look like? Use the desmos to change the sliders to match the function and compare.

f(x) = -cos(3x) f(x) = 2cos(x+) + 3