## Exploring Trig Equations

(Writing \& Graphing)

## Directions:

- Go to desmos.com
- The $1^{\text {st }}$ thing you are going to do is set you $x$ and $y$ values.
a. On the right hand side, click on the wrench.
b. For the $x$ values, the lowest value will be $-\frac{\pi}{2}$, the highest value will be $2 \pi$, and the step will be $\frac{\pi}{2}$.
c. For the $y$ values, the lowest value will be -3 , the highest value will be 3 , and the step will be 1 .

Throughout this activity, it is ok to adjust your $x$ and $y$ values.

## Sin vs. Cos

1. Graph the trig function $y=\sin \theta$.
a. Graph the trig function on the interval $0 \leq \theta \leq 2 \pi$.
b. Explain some key features of the graph.

2. Graph the trig function $y=\cos \theta$.
a. Graph the trig function on the interval $0 \leq \theta \leq 2 \pi$.
b. Explain some key features of the graph.

3. Looking the graphs of $y=\sin \theta$ and $y=\cos \theta$, identify some similarities and differences between the graphs.

## Vertical Shift (midline)

4. On the interval $0 \leq \theta \leq 2 \pi$, graph the trig function $y=\sin \theta+3$.
a. How does this sin graph compare to the sin graph in question 1?

5. On the interval $0 \leq \theta \leq 2 \pi$, graph the trig function $y=\sin \theta-1$.
a. How does this $\sin$ graph compare to the sin graph in question 1 ?

6. On the interval $0 \leq \theta \leq 2 \pi$, graph the trig function $y=\cos \theta-2$.
a. How does this cos graph compare to the cos graph in question 2?

7. On the interval $0 \leq \theta \leq 2 \pi$, graph the trig function $y=\cos \theta+1$.
a. How does this cos graph compare to the $\cos$ graph in question 2 ?

8. In your own words, explain the meaning of vertical shift and how to identify it from an equation.

## Amplitude (height and depth of each graph)

9. Graph the equation $y=2 \sin \theta$.
a. How does this sin graph compare to the sin graph in question 1?

10. Graph the equation $y=\frac{1}{2} \cos \theta$.
a. How does this cos graph compare to the cos graph in question 2 ?

11. Without graphing, determine the amplitude of the equations below.
a. $y=4 \cos \theta$
b. $y=\frac{1}{3} \sin \theta$
12. Graph the equations in question 11. Explain what happened to the graph compared to the original sin and cos graphs in questions 1 and 2.


13. In your own words, explain the meaning of amplitude and how to identify it from an equation.

## Period (5 critical points)

14. Looking at the sin graph on the interval $0 \leq \theta \leq$ $2 \pi$,
a. Circle and write the points that you think are the 5 critical points. Explain your reasoning.
b. What is the distance (in radians) between one of the 5 critical points and the next matching point?

15. Looking at the cos graph on the interval $0 \leq \theta \leq$ $2 \pi$,
a. Circle and write the points that you think are the 5 critical points. Explain your reasoning.
b. What is the distance (in radians) between one of the 5 critical points and the next matching
 point?
16. On the interval $0 \leq \theta \leq 2 \pi$, graph the equation $y=\sin 2 \theta$.
a. What is the period of the graph (meaning, what is the distance between two matching points)?

17. On the interval $0 \leq \theta \leq 4 \pi$, graph the equation $y=\cos \frac{1}{2} \theta$.
a. What is the period of the graph (meaning, what is the distance between two matching points)?

18. In your own words, explain the meaning of period and how to identify it from an equation.

## Frequency (how many times the period occurs in 360)

19. Graph the equation $y=\sin 4 \theta$.
a. What is the frequency of the graph (how many times does the graph repeat between the interval $0 \leq$ $\theta \leq 2 \pi)$ ?

20. Graph the equation $y=\cos \frac{1}{2} \theta$.
a. What is the frequency of the graph (how many times does the graph repeat between the interval $0 \leq \theta \leq 2 \pi)$ ?

21. What is the frequency of the graphs? Justify your answer.

22. In your own words, explain the meaning of frequency and how to identify it from an equation.
