7.2b More on Graphs of Sine and Cosine: Vertical Shift

# OBJECTIVE 3: Sketching Graphs of the Form  and

The “+ *D*” added to the functions we have been graphing causes a **vertical shift** of the graph.

**If  , the shift is *D* units up, but if  , the shift is *D* units down.**

**Steps for Sketching Functions of the Form ** **and **

1. Rewrite the function as or . If, then use the even and odd properties of the sine and cosine function to write the function in an equivalent form such that .

**We now use this new form to determine the amplitude, period, and phase shift.**

1. The amplitude is . The range is .
2. The period is .
3. The phase shift is .
4. The *x-*coordinate of the first quarter point is . The *x-*coordinate of the last quarter point is . An interval for one complete cycle is . Subdivide this interval into 4 equal subintervals of length  by starting with  and adding to the *x-*coordinate of each successive quarter point.
5. Multiply the *y-*coordinates of the quarter points of or  by *A* and then add *D* to determine the *y-­*coordinates of the corresponding quarter points for **** and **.**
6. Connect the quarter points to obtain one complete cycle.

# OBJECTIVE 4: Determine the Equation of a Function of the Form  or  Given Its Graph