
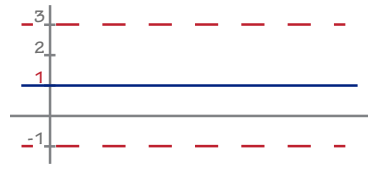
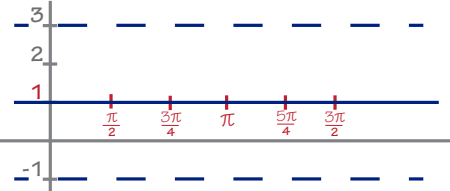


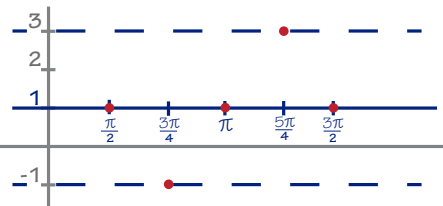
## Sine & Cosine

We'll use  $y = 2 \sin(-2x + \pi) + 1$  as our example.

|  |  |
|--|--|
| <p>1 <i>Rewrite as needed</i>, factoring out x coefficients and moving or removing negative values within the function parentheses.</p>  | $y = 2 \sin(-2x + \pi) + 1$ $y = 2 \sin(-2(x - \frac{\pi}{2}) + 1$ $y = -2 \sin(2(x - \frac{\pi}{2}) + 1$  |
| <p>2 <i>List the function's data</i></p> <ul style="list-style-type: none"> <li>▷ Amplitude</li> <li>▷ Period</li> <li>▷ Quarter-period</li> <li>▷ Phase (horizontal) shift</li> <li>▷ Vertical shift</li> </ul>   | <p>A: 2 (reflected)<br/>                     P: <math>\pi</math><br/>                     Q-P: <math>\frac{\pi}{4}</math><br/>                     PhS: <math>\frac{\pi}{2}</math> left<br/>                     VS: 1</p>   |
| <p>3 <i>Map out new period</i><br/>                     offset ... (Offset+Period)</p>   | $\frac{\pi}{2} \dots \frac{3\pi}{2}$   |
| <p>4 <i>List "critical points"</i> by repeatedly adding the quarter-period to the offset.<br/>                     offset, pt 1, pt 2, pt 3, (End-of-period)</p>   | $\frac{2\pi}{4}, \frac{3\pi}{4}, \frac{4\pi}{4}, \frac{5\pi}{4}, \frac{6\pi}{4}$ <p>Tip: It's usually easier to keep all the points unreduced while you're adding the quarter-periods then reduce when you're done.</p> $\frac{\pi}{2}, \frac{3\pi}{4}, \pi, \frac{5\pi}{4}, \frac{3\pi}{2}$ |
| <p>5 <i>Draw function axis</i> on coordinate system<br/>                     This will be a horizontal line at the vertical shift position<br/>                     Label the y-value</p>  |    |
| <p>6 <i>Draw dashed envelope lines</i> at a distance of the amplitude above and below the function axis.</p>   |    |
| <p>7 <i>Mark the critical points</i> on the function axis<br/>                     Don't bother being particularly accurate relative to the origin; just make sure you label their x-values<br/>                     Your teacher may want you to also mark them on the x-axis</p> |    |

8 *Mark the points* where the graph of the function will touch the envelope and cross the function axis.

Don't forget to apply reflection, if needed



9 *Connect the points* with a smooth curve

