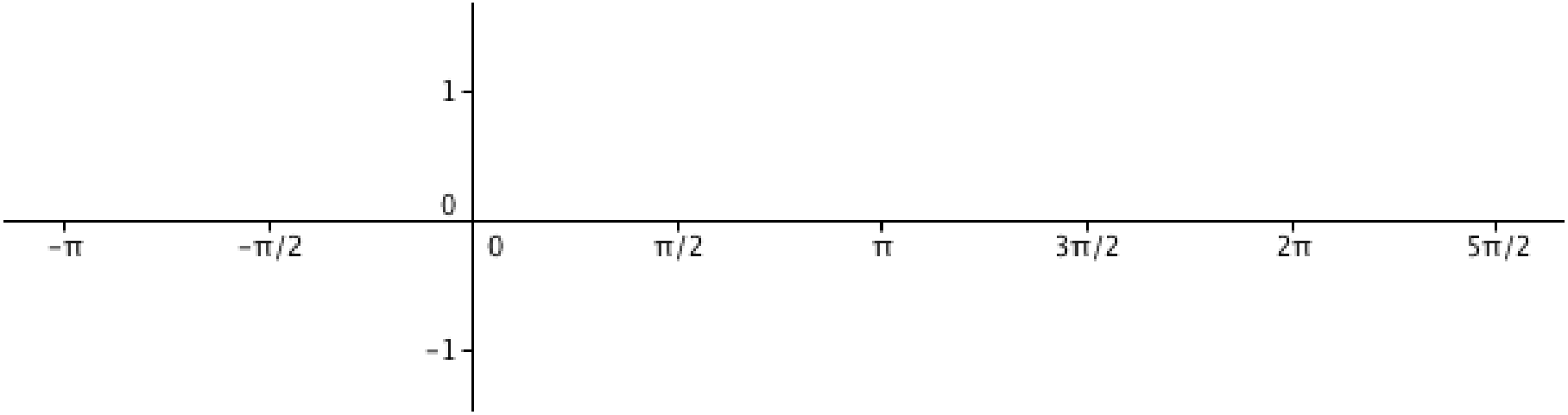
Pre-Calculus Sec. 4.5
Graphs of Sine and Cosine

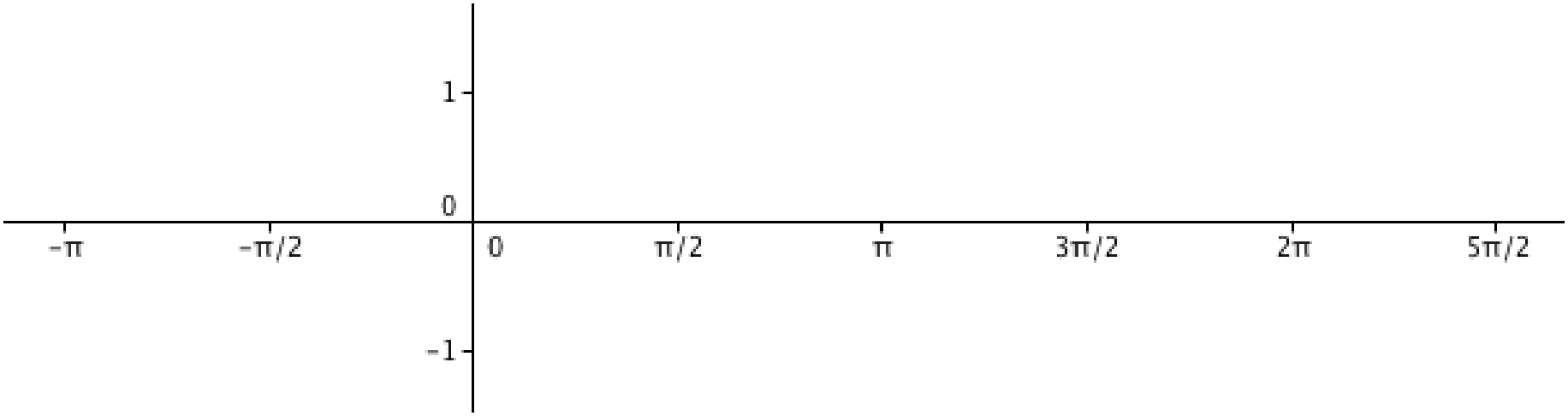
The Graph of f(x) = sin x



Domain: **Range:** **Period:**

This graph has _____ symmetry, and is an _____ function.

The Graph of f(x) = cos x



Domain: **Range:** **Period:**

This graph has _____ symmetry, and is an _____ function.

Recall:

- $y = c\,f(x)$: Vertically stretches or shrinks.
- $y = f(cx)$: Horizontally stretches or shrinks.

Because these change our "Basic" graphs, our basic **period** and **amplitude** may also change.

If $y = a \sin bx$ and $y = a \cos bx$; where $a \neq 0$, $b > 0$,

Then: Amplitude = $|a|$ and Period = $\frac{2\pi}{|b|}$

$f(x) = a \sin (bx - c) + d$ or $f(x) = a \cos (bx - c) + d$

$f(x) = d + a \sin (bx - c)$ or $f(x) = a \cos b(x - \frac{c}{b}) + d$

Horizontal translations (left or right): Graphs are shifted by an amount $\frac{c}{b}$ (this # is the ***phase shift***).

Vertical translations (up or down): d units upward or downward, the graph oscillates about the horizontal line $y = d$ instead of the x-axis.

Ex.1: Graph $f(x) = 3 + 2\sin\left(x + \frac{\pi}{3}\right)$

Amplitude:

Period:

Phase Shift:

1st: Find increment (¼ Period):

2nd: Find 5 key x-values:

Ex.2: Graph $f(x) = -3\cos\left(x - \frac{\pi}{5}\right) + 1$

Amplitude:

Period:

Phase Shift:

1st: Find increment (¼ Period):

2nd: Find 5 key x-values:

Ex.3: Graph $y = -2\sin\left(4x - \frac{\pi}{3}\right) + 5$

Amplitude:

Period:

Phase Shift:

1st: Find increment (¼ Period):

2nd: Find 5 key x-values: