

Investigation 2

Comparing the graphs of $y = \sin x + c$ and $y = \sin x$

It is time to consider different values of c in the equation $y = \sin x + c$ to see what effect it has on the graph of $y = \sin x$.

In this investigation, there are two situations to consider:

- $c > 0$
- $c < 0$

When $c > 0$ for the equation $y = \sin x$

The amplitude is 1

The period is 360

The domain is $\{x \in \mathcal{R}\}$

The range is $\{y \in \mathcal{R} \mid -1 \leq y \leq 1\}$

The x intercepts are $0^\circ, 180^\circ, 360^\circ$

The y intercept is 0

The minimum value is -1

The maximum value is 1

When $c > 0$ for the equation $y = \sin x + 1$

The amplitude is 1

The period is 360

The domain is $\{x \in \mathcal{R}\}$

The range is $\{y \in \mathcal{R} \mid -1 \leq y \leq 1\}$

The x intercepts are $0^\circ, 180^\circ, 360^\circ$

The y intercept is 1

The minimum value is 0

The maximum value is 2

When $c > 0$ for the equation $y = \sin x + 2$

The amplitude is 1

The period is 360

The domain is $\{x \in \mathcal{R}\}$

The range is $\{y \in \mathcal{R} \mid -1 \leq y \leq 1\}$

The x intercepts are $0^\circ, 180^\circ, 360^\circ$

The y intercept is 2

The minimum value is 1

The maximum value is 3

When $a > 0$ for the equation $y = \sin x + 3$

The amplitude is 1

The period is 360

The domain is $\{x \in \mathcal{R}\}$

The range is $\{y \in \mathcal{R} \mid -1 \leq y \leq 1\}$

The x intercepts are $0^\circ, 180^\circ, 360^\circ$

The y intercept is 3

The minimum value is 2

The maximum value is 4

When $a < 0$ for the equation $y = \sin x$

The amplitude is 1

The period is 360

The domain is $\{x \in \mathcal{R}\}$

The range is $\{y \in \mathcal{R} \mid -1 \leq y \leq 1\}$

The x intercepts are $0^\circ, 180^\circ, 360^\circ$

The y intercept is 0

The minimum value is -1

The maximum value is 1

When $a < 0$ for the equation $y = \sin x$

The amplitude is 1

The period is 360

The domain is $\{x \in \mathcal{R}\}$

The range is $\{y \in \mathcal{R} \mid -1 \leq y \leq 1\}$

The x intercepts are $0^\circ, 180^\circ, 360^\circ$

The y intercept is -1

The minimum value is -2

The maximum value is 0

When $c < 0$ for the equation $y = \sin x$

The amplitude is 1

The period is 360

The domain is $\{x \in \mathcal{R}\}$

The range is $\{y \in \mathcal{R} \mid -1 \leq y \leq 1\}$

The x intercepts are $0^\circ, 180^\circ, 360^\circ$

The y intercept is -2

The minimum value is -3

The maximum value is -1

When $c < 0$ for the equation $y = \sin x$

The amplitude is 1

The period is 360

The domain is $\{x \in \mathcal{R}\}$

The range is $\{y \in \mathcal{R} \mid -1 \leq y \leq 1\}$

The x intercepts are $0^\circ, 180^\circ, 360^\circ$

The y intercept is -3

The minimum value is -4

The maximum value is -2

Summary of the role of c in $y = \sin x + c$ in transforming the graph of $y = \sin x$

When $c > 0$ there is a vertical shift up c units, which does not change the amplitude, period, or domain but does change the range, x-intercepts, y-intercept, minimum and maximum values.

When $c < 0$ there is a vertical shift down c units, which does not change the amplitude, period, or domain but does change the range x-intercepts, y-intercept, minimum and maximum values.

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