

Investigation 3

Comparing the graphs of $y = \sin(x - d)$ and $y = \sin x$

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

In this investigation, there are two situations to consider:

- $d > 0$
- $d < 0$

When $d > 0$ for the equation $y = \sin(x - d)$

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 $d > 0$ for the equation $y = \sin(x - 45^\circ)$

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 $45^\circ, 225^\circ, 405^\circ$

The y intercept is -0.71

The minimum value is -1

The maximum value is 1

When $d > 0$ for the equation $y = \sin(x - 90^\circ)$

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 $90^\circ, 270^\circ, 450^\circ$

The y intercept is -1

The minimum value is -1

The maximum value is 1

When $a > 0$ for the equation $y = \sin(x - 135^\circ)$

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 -0.71

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 0

The minimum value is -1

The maximum value is 1

When $a < 0$ for the equation $y = \sin(x + 45^\circ)$

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 $-45^\circ, 135^\circ, 315^\circ$

The y intercept is 0.71

The minimum value is -1

The maximum value is 1

When $c < 0$ for the equation $y = \sin(x + 90^\circ)$

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 $-90^\circ, 90^\circ, 270^\circ$

The y intercept is 1

The minimum value is -1

The maximum value is 1

When $c < 0$ for the equation $y = \sin(x + 135^\circ)$

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 $-135^\circ, 45^\circ, 225^\circ$

The y intercept is 0.71

The minimum value is -1

The maximum value is 1

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

When $d > 0$, the graph of $y = \sin x$ shifts d degrees to the right, which does not change the amplitude, period, domain, range, minimum and maximum values but does change the x-intercepts and y-intercept.

When $d < 0$, the graph of $y = \sin x$ shifts d degrees to the left, which does not change the amplitude, period, domain, range, minimum and maximum values but does change the x-intercepts and y-intercept.

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