

Part 1: Sine Graphs with Dilations

Without graphing, describe in words the relationship between each pair of graphs. Include in your explanation differences you might notice in amplitude, period, reflection, etc. (Use appropriate vocabulary!)

- 1) $f(x) = \sin 3x$ and $g(x) = \sin(-3x)$ * $\sin(-x) = -\sin x$
 Pos Neg
 $3x = -\sin(3x)$ Reflected x-axis
- 2) $f(x) = -2\sin x$ and $g(x) = 4\sin x$
 Neg Pos
 Neg reflects x-axis, 2 vs 4 (4 has a larger amplitude)
- 3) $f(x) = \sin x$ and $g(x) = \sin \frac{x}{3}$
 $b=1$ $b=\frac{1}{3}$ Period $\frac{2\pi}{b} = \frac{2\pi}{1/3} = 2\pi \cdot 3 = 6\pi$

State the amplitude and period for each of the following functions. Then graph one complete period of each, remembering to label the tick divisions on both your horizontal axis and vertical axis. Also state the domain and range of one period using interval notation.

*** Remember: $\theta \rightarrow$ degrees and $x \rightarrow$ radians.

4) $y = 3\sin 2x$ $2x=0 \quad 2x=2\pi$
 $x=0 \quad x=\pi$
 Amplitude = 3
 Period = $\frac{2\pi}{b} = \frac{2\pi}{2} = \pi$
 $D = [0, \pi]$
 $R = [-3, 3]$

5) $y = \sin(-4\theta)$ $4\theta=0 \quad 4\theta=360$
 $\theta=0^\circ \quad \theta=90^\circ$
 $y = -\sin(4\theta)$
 Amp. = 1
 Period = $\frac{360^\circ}{4} = 90^\circ$
 $D = [0, 90^\circ]$
 $R = [-1, 1]$

6) $y = \sin\left(\frac{1}{3}x\right)$ $\frac{1}{3}x=0 \quad \frac{1}{3}x=2\pi$
 $x=0 \quad x=6\pi$
 Amp. = 1
 Period = $\frac{2\pi}{1/3} = 2\pi \cdot 3 = 6\pi$
 $D = [0, 6\pi]$
 $R = [-1, 1]$

7) $y = 4\sin \frac{\theta}{2}$ $\frac{\theta}{2}=0 \quad \frac{\theta}{2}=360$
 $\theta=0^\circ \quad \theta=720^\circ$
 Amp. = 4
 Period = $\frac{360}{1/2} = 360 \cdot 2 = 720^\circ$
 $D = [0, 720^\circ]$
 $R = [-4, 4]$

8) $y = -2\sin 4x$ $4x=0 \quad 4x=2\pi$
 $x=0 \quad x=\pi/2$
 Amp = $|-2| = 2$
 Period = $\frac{2\pi}{4} = \frac{\pi}{2}$
 $D = [0, \frac{\pi}{2}]$
 $R = [-2, 2]$

9) $y = 6\sin \frac{3\theta}{4}$ $\frac{3\theta}{4}=0 \quad \frac{3\theta}{4}=360$
 $\theta=0^\circ \quad \theta=480^\circ$
 Amp = 6
 Period = $\frac{360}{3/4} = 360 \cdot \frac{4}{3} = 480^\circ$
 $D = [0, 480^\circ]$
 $R = [-6, 6]$

10) $y = -2\sin\left(-\frac{1}{5}x\right)$ $\frac{1}{5}x=0 \quad \frac{1}{5}x=2\pi$
 $x=0 \quad x=10\pi$
 $y = 2\sin\left(\frac{1}{5}x\right)$
 Amp = 2
 Period = $\frac{2\pi}{1/5} = 2\pi \cdot 5 = 10\pi$
 $D = [0, 10\pi]$
 $R = [-2, 2]$

11) $y = \frac{5}{2}\sin \frac{\pi x}{6}$ $\frac{\pi x}{6}=0 \quad \frac{\pi x}{6}=2\pi$
 $x=0 \quad x=12$
 Amp = $\frac{5}{2} = 2\frac{1}{2}$
 Period = $\frac{2\pi}{\pi/6} = 2\pi \cdot \frac{6}{\pi} = 12$
 $D = [0, 12]$
 $R = [-2\frac{1}{2}, 2\frac{1}{2}]$