Foundation Mathematics 1017SCG
Week 9 Summary Sheet

Graphing Trigonometric Functions

$$y = A\sin[B(x+C)] + D$$
$$y = A\cos[B(x+C)] + D$$

- The **amplitude** is $|A|$
- The **period** is $\frac{360}{B}$ degrees or $\frac{2\pi}{B}$ radians
- The **horizontal shift (phase shift)** is C
- The **vertical shift** is D

The graph of $y = -\sin(x)$ is a **reflection** of the graph $y = \sin(x)$ across the x axis.

Example Consider the graph of $y = 3\sin(2x) + 1$ (Graph at the bottom of the page)

- The amplitude is 3
- The period is 180° or π radians
- There is no horizontal shift (no phase shift)
- The vertical shift is 1 up

Example Consider the graph of

$$y = 5\cos\left[4\left(x - \frac{\pi}{4}\right)\right] - 3$$

- The amplitude is 5
- The period is $\frac{\pi}{2}$
- The horizontal shift is $\frac{\pi}{4}$ to the right
- The vertical shift is 3 down

Limits

Example Evaluate $\lim_{x\to 5} \frac{x^2-25}{x-5}$

$$\begin{aligned}\lim_{x\to 5} \frac{x^2-25}{x-5} &= \lim_{x\to 5} \frac{(x+5)(x-5)}{x-5}\\ &= \lim_{x\to 5} x+5\\ &= 5+5\\ &= 10\end{aligned}$$

Example Evaluate $\lim_{x\to 2} \frac{x^2-8x+12}{x-2}$

$$\begin{aligned}\lim_{x\to 2} \frac{x^2-8x+12}{x-2} &= \lim_{x\to 2} \frac{(x-6)(x-2)}{x-2}\\ &= \lim_{x\to 2} x-6\\ &= 2-6\\ &= -4\end{aligned}$$

Continuous Functions

For the function $f(x)$ to be continuous at $x = a$, it must satisfy the following criteria:

- $f(a)$ exists
- $\lim_{x\to a} f(x)$ exists
- $\lim_{x\to a} f(x) = f(a)$

Example Determine if $f(x) = \frac{6}{x-2}$ is continuous.
At $x = 2$, the function is undefined (divide by zero). Therefore the function is discontinuous at $x = 2$ (as it does not satisfy the first criteria).