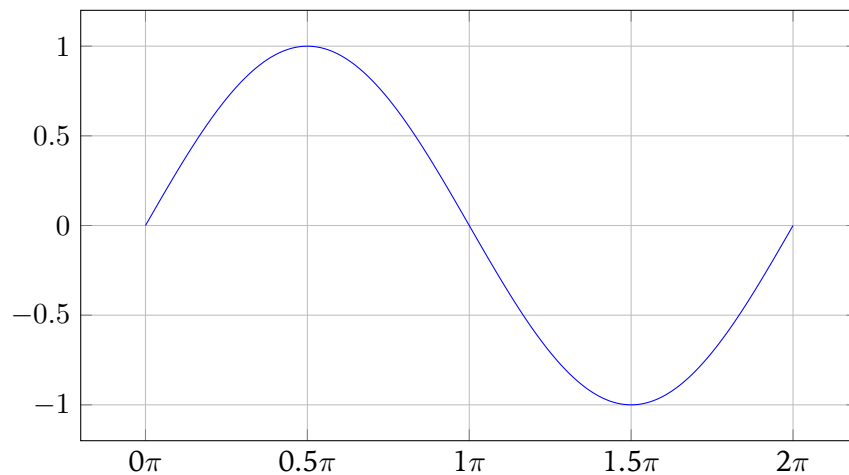# Digital Sound

CST 205

The Sine Wave

$y = sin(x)$

The simplest waveform that we can generate is the sine wave. The x-axis represents time and the y-axis represents *amplitude*. One complete cycle of a 1 Hz sine wave starts at 0 on the y-axis and ends at 0 at the y-axis. At the end of the wave, we are at 1 second of time and 2π on the x-axis.

Frequency is the number of cycles of a waveform per second. High pitch waveform will go through a lot more cycles per second.

We need a sequence of sample values to produce digital audio. We need to measure our sound-waves at fixed intervals.

For digital, we use the following formula, where f is frequency in Hz, *SPS* is samples per second and t is time as a sample number:

$$y = sin\left(\frac{2\pi \cdot f}{SPS} \cdot t\right)$$

Samples per second is going to be 44,100 Hz.

Our sequence of samples, $t_0, t_1, \ldots, t_n$, will look like:

$$y(t_0) = sin\left(\frac{2\pi f}{SPS} \cdot t_0\right)$$

$$y(t_1) = sin\left(\frac{2\pi f}{SPS} \cdot t_1\right)$$

$$y(t_2) = sin\left(\frac{2\pi f}{SPS} \cdot t_2\right)$$

$$\vdots$$

$$y(t_n) = sin\left(\frac{2\pi f}{SPS} \cdot t_n\right)$$