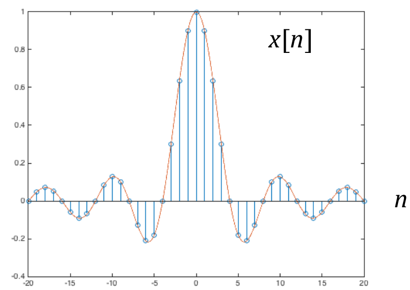
<u>Tune-Up Tuesday for October 24, 2017</u>

The sinc pulse is commonly used in interpolation:

$$x(t) = \text{sinc}(2 f_0 t) = \frac{\sin(2\pi f_0 t)}{2\pi f_0 t}$$

We sample the sinc pulse to create (plot on right)

$$x[n] = x(nT_s) = x\left(\frac{n}{f_s}\right) = \text{sinc}\left(2\frac{f_0}{f_s}n\right) = \frac{\sin(\hat{\omega}_0 n)}{\hat{\omega}_0 n}$$




```
f0 =    50;
fs =   400;
fnorm = 2*f0/fs;
nmax = 20;
n = -nmax : nmax;
x = sinc(fnorm*n);
stem(n, x);
```

Define $x[n]$ on the right and evaluate `freqz(x)`:

(a) Lowpass, highpass, bandpass, bandstop, allpass?

(b) What is the bandwidth in discrete-time frequency as a function of f_0 and f_s? Try different values of f_0.

(c) Bandwidth in continuous-time frequency as a function of f_0?

The command `freqz(x)` plots the magnitude and phase of the frequency response of a signal $x[n]$.

$$\hat{\omega}_0 = 2\pi\frac{f_0}{f_s} = 2\pi\frac{50}{400} = \frac{\pi}{4}$$

```
% Code for above plot
stem(n, x);
hold on;
t = -nmax : 0.01 : nmax;
y = sinc(fnorm*t);
plot(t, y);
hold off;
```