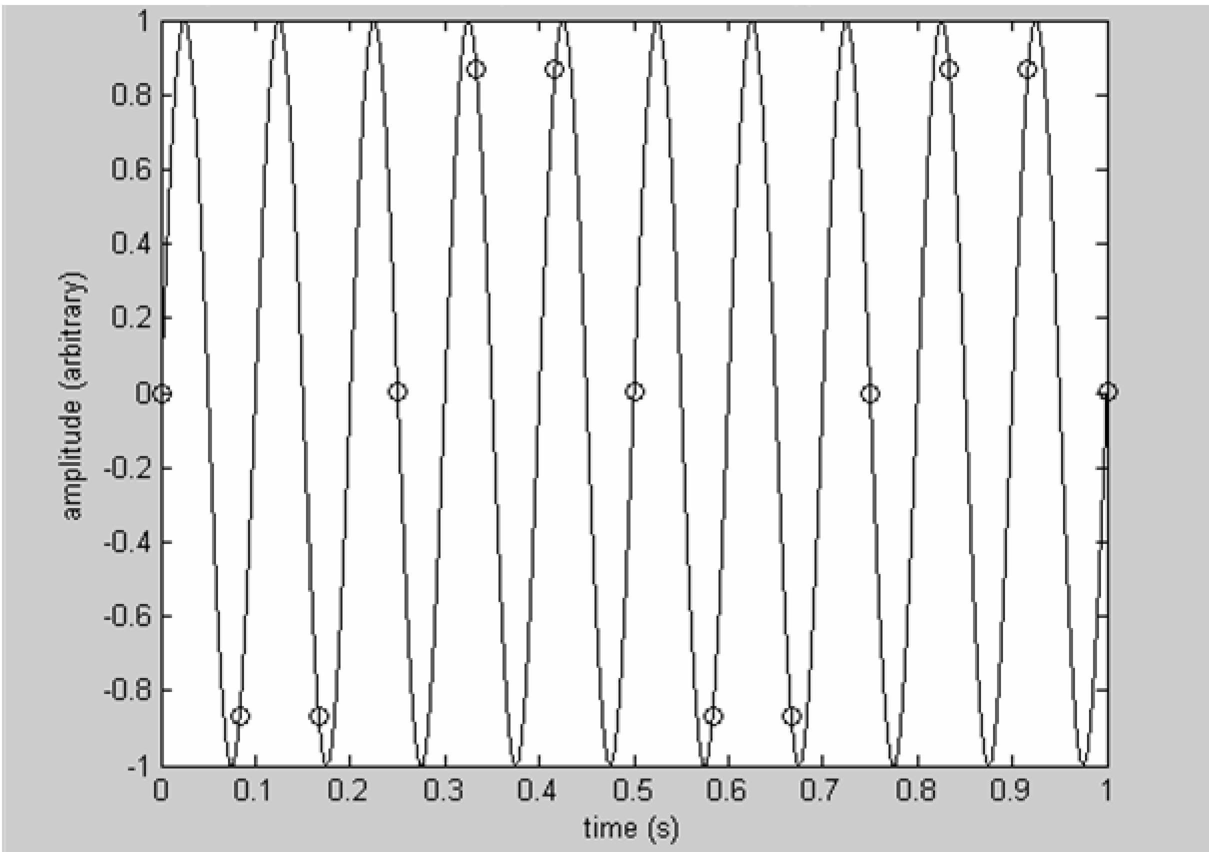
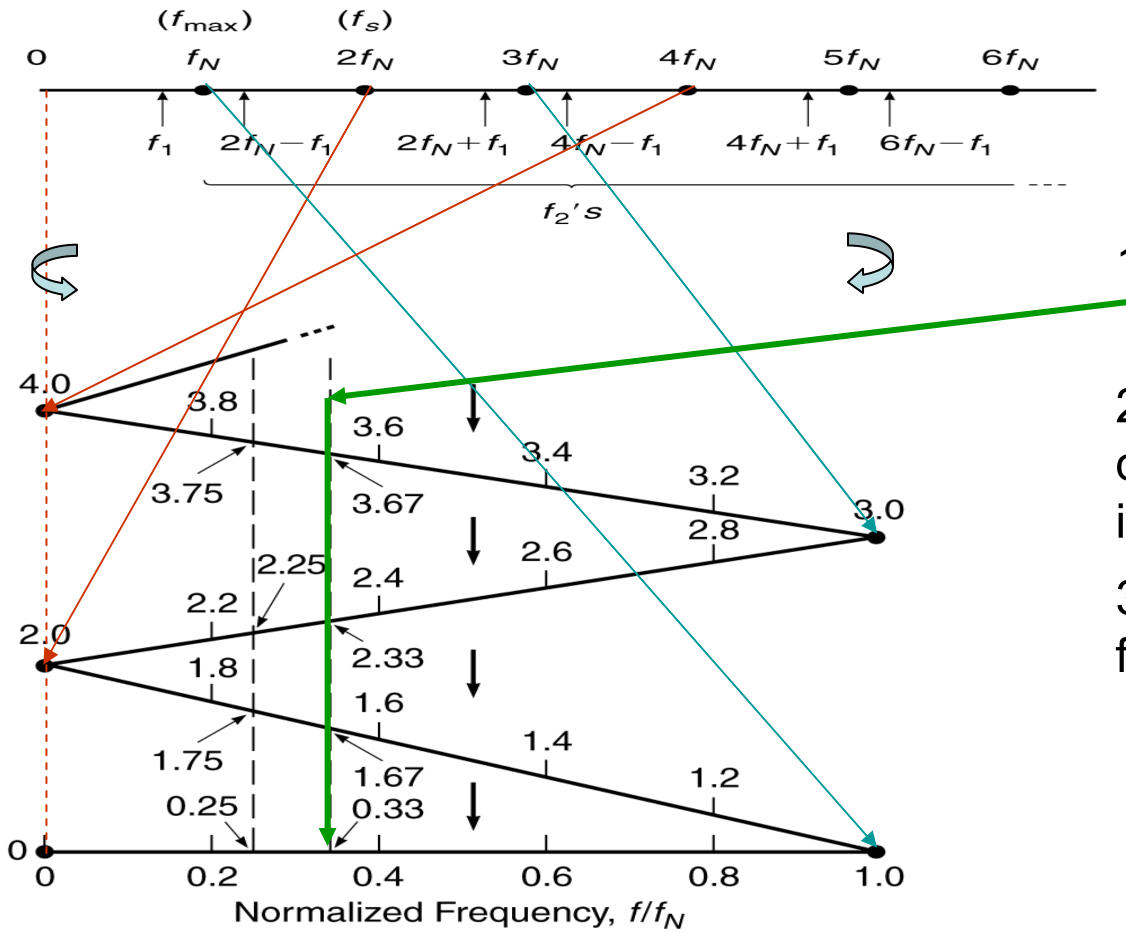
Aliasing of $\sin(20\pi t)$



$y(t) = \sin(20\pi t)$

$\rightarrow f = 10$ Hz
with
$f_s = 12$ Hz

The Folding Diagram

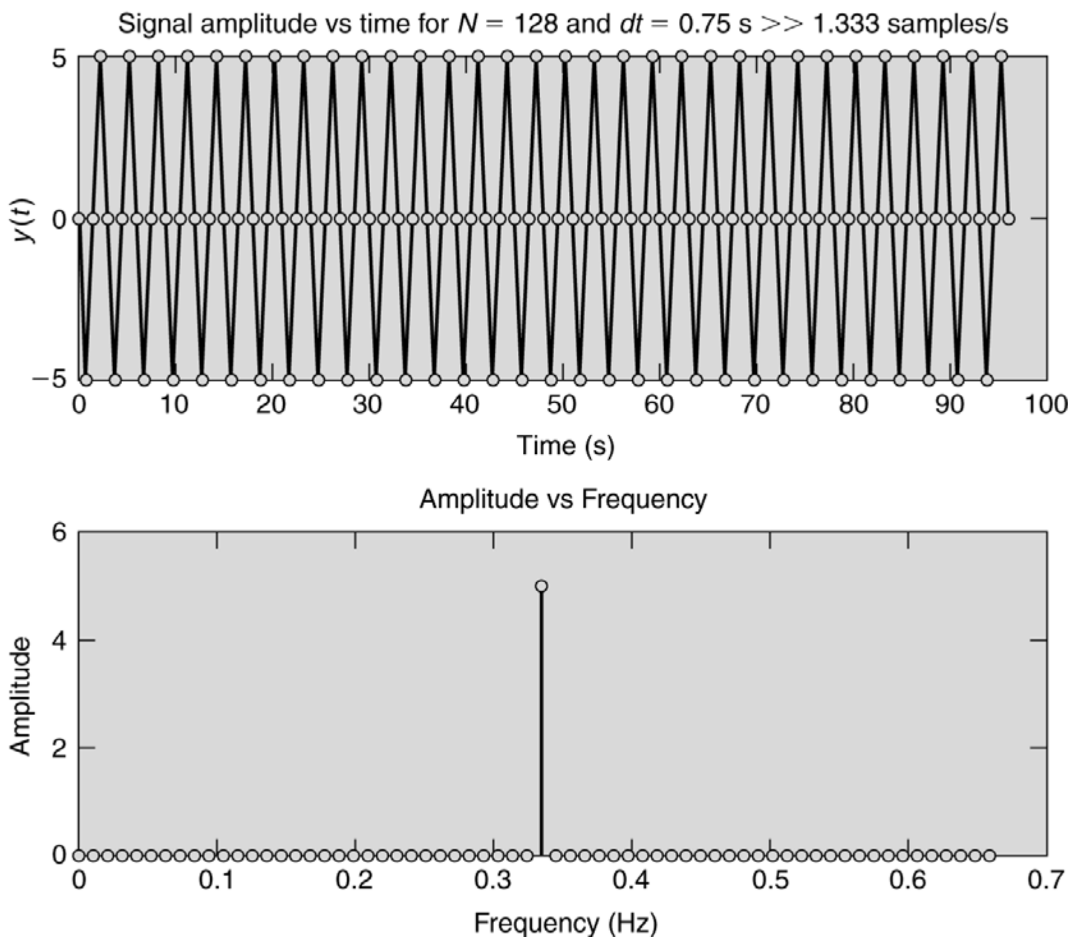


Figures 12.8 and 12.9

To determine the aliased frequency, f_a:

1. Determine k, where
   $k = f/f_N = 2f/f_s$
2. Using the folding diagram, find the k_a, into which k folds.
3. Calculate the aliased frequency, where
   $f_a = k_a f_N = k_a f_s/2$

Aliasing of $\sin(20\pi t)$



$y(t) = 5\sin(2\pi t)$
$\rightarrow f = 1$ Hz
$f_s = 1.33$ Hz

Figure 12.13

In-Class Example

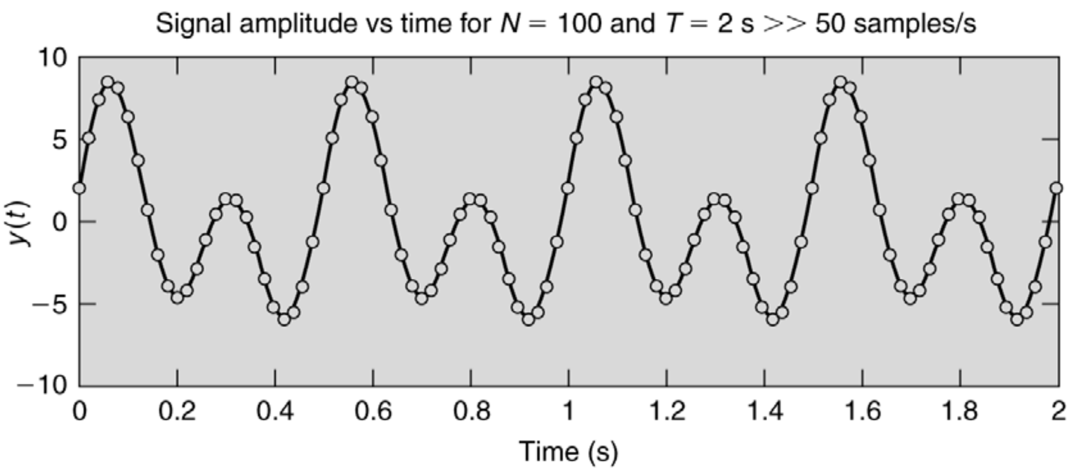
- At what cyclic frequency will $y(t) = 3\sin(4\pi t)$ appear if $f_s = 6$ Hz?

  $f_s = 4$ Hz ?

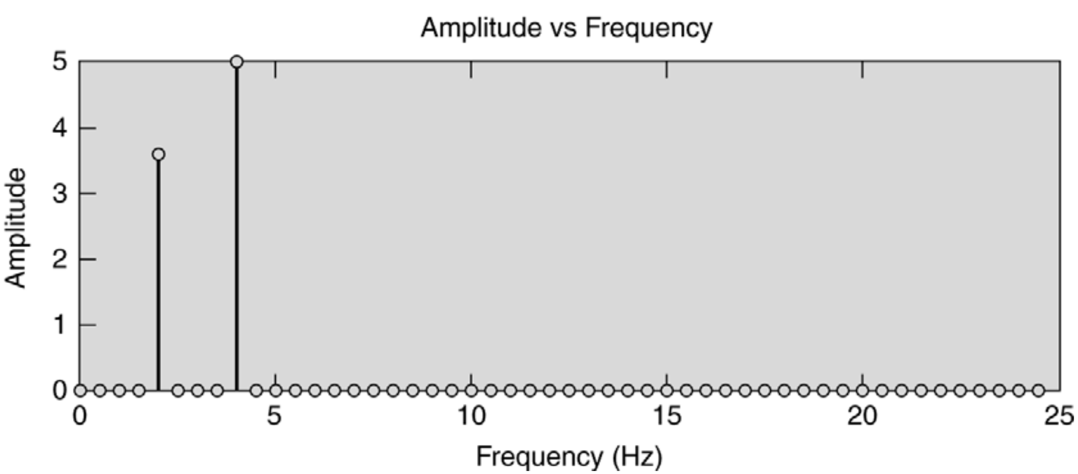
  $f_s = 2$ Hz ?

  $f_s = 1.5$ Hz ?

Correct Sample Time Period



$y(t) = 3.61\sin(4\pi t+0.59) + 5\sin(8\pi t)$



f's of 2 Hz and 4 Hz

$\rightarrow$

T's = 0.5 s and 0.25 s

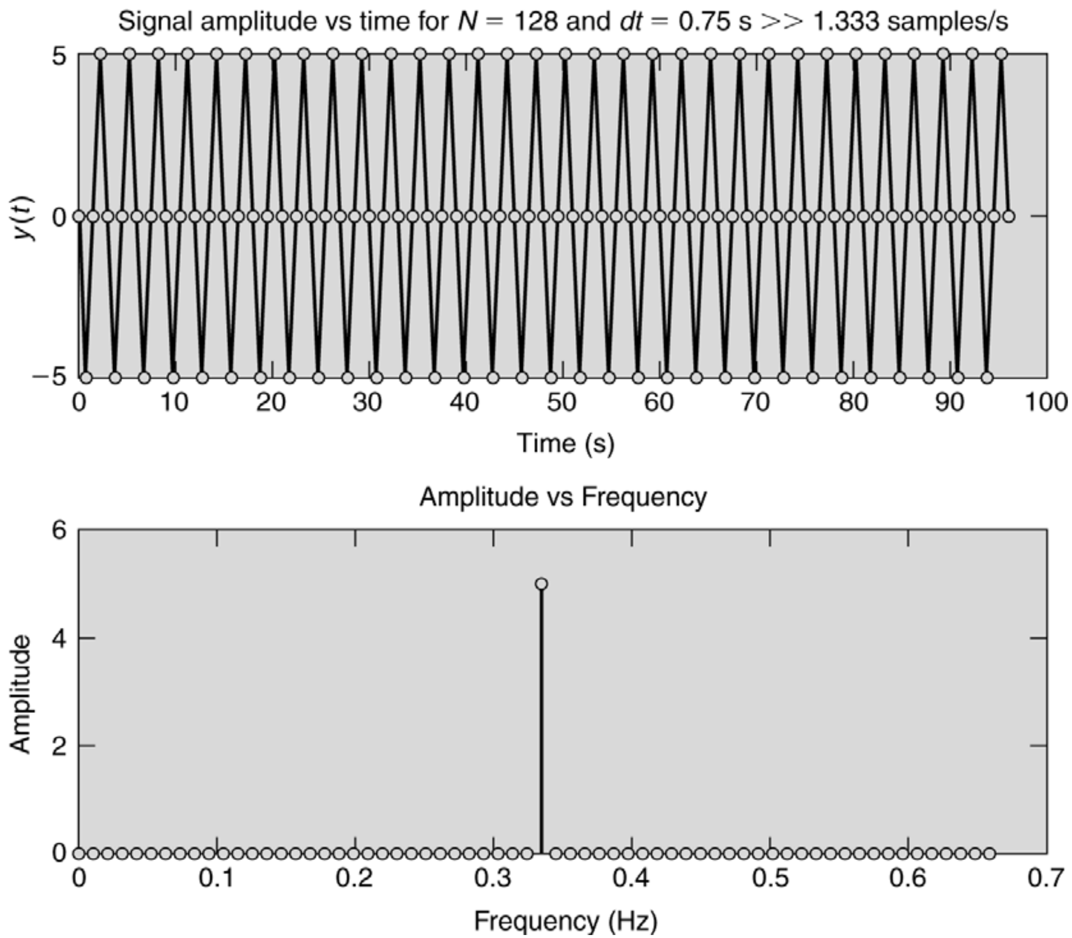
$\rightarrow$

use T = m(0.5) s

m = 1 or 2 or 3 …

Figure 12.16

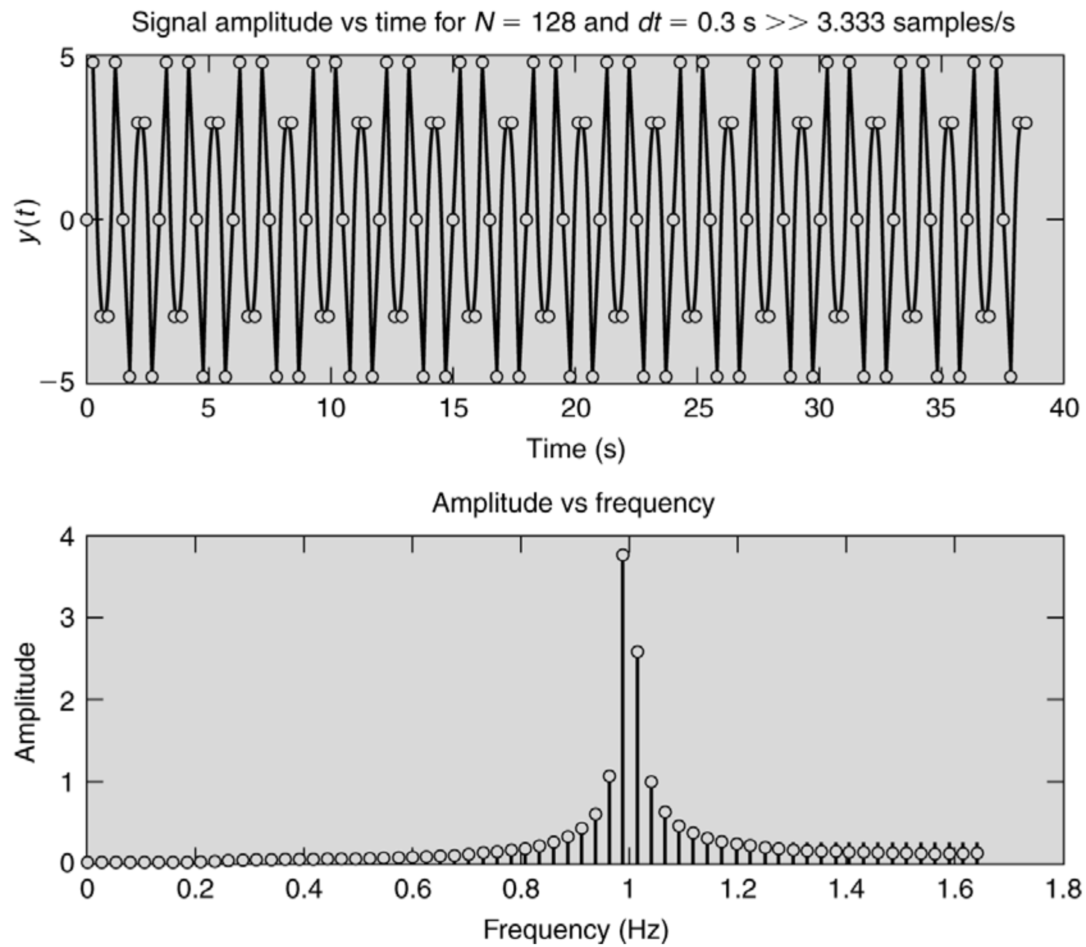
Sampling with Aliasing



$y(t) = 5\sin(2\pi t)$
$\rightarrow f = 1$ Hz
$f_s = 1.33$ Hz

Figure 12.13

Sampling with Amplitude Ambiguity



$y(t) = 5\sin(2\pi t)$
$\rightarrow f = 1$ Hz
$f_s = 3.33$ Hz

Figure 12.12

In-Class Example

$$y(t) = 6 + 2\sin(\pi t/2) + 3\cos(\pi t/5) + 4\sin(\pi t/5 + \pi) - 7\sin(\pi t/12)$$

f_i (Hz):

T_i (s):

Smallest sample period that contains all integer multiples of the T_i's:

$\longrightarrow$ T can be set at 120, 240, 360, … to avoid amplitude ambiguity

Smallest sampling to avoid aliasing (Hz):