



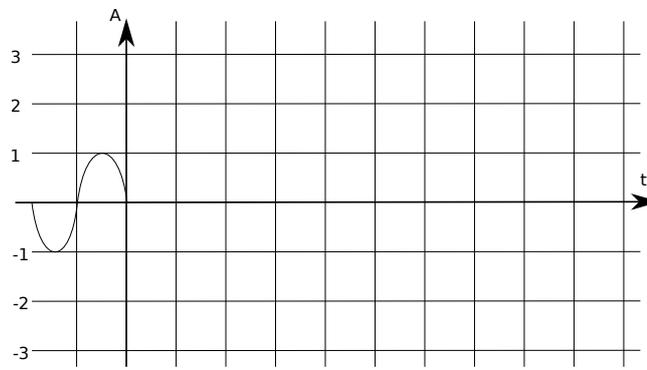
## 5. Modulation

A sender transmits the bit sequence 000110010011. A combination of amplitude shift keying (ASK) and differential phase shift keying (Differential PSK) is used. The base frequency is  $f$ . Differential phase shift keying means that the signal is shifted by the given phase relative to the current value. The following coding table is to be used:

Symbol	Amplitude	Phase Shift
00	1	0
01	2	0
10	1	$\pi$
11	2	$\pi$

For simplicity each symbol is sent for  $\frac{1}{2}T$ .

- (a) In the following diagram the base signal  $s(t) = \sin(2\pi ft)$  for  $\frac{1}{f}$  seconds is shown. Continue the signal waveform based on the given bit sequence.



- (b) The receiver has scanned the values 0, 1, 0, 0, -1, 1, 0, 0, 2 at the times depicted in the following diagram. For higher efficiency, consider every 3-tupel of bits encoded as follows:

Symbol	Amplitude	Phase
000	1	0
001	2	0
010	1	$\frac{\pi}{2}$
011	2	$\frac{\pi}{2}$
100	1	$\pi$
101	2	$\pi$
110	1	$\frac{3\pi}{2}$
111	2	$\frac{3\pi}{2}$

Modulate the transferred bit sequence and sketch the signal waveform.

