Part 4: All required changes are thought with respect to original FSWave function.

Part 2:

→ Required change is I need to reverse the X_k array. As an example:

$$x_k = [1, 1, 2] \xrightarrow{\text{reverse}} y_k = x_{-k} = [2, 1, 1]$$

To achieve this, flip( ) function is used. The effect of the operation is time reversal, because $y_k = x_{-k}$

Let $x(t) = \sum_{k=-K}^{K} X_k e^{+jk\omega t}$

$$y(t) = \sum_{k=-K}^{K} X_{-k} e^{+jk\omega t} = \sum_{k=-K}^{K} X_k e^{-jk\omega t} = x(-t) \checkmark$$

Part 6:

→ Required change is I need to multiply X_k values with $e^{-j\frac{2\pi k t_0}{T}}$ when I calculate X_k.

• I need to multiply the formula derived in part 2 with $e^{-j\frac{2\pi k t_0}{T}}$.

• I also create another parameter for fswave, which is t_0, so that I can calculate y_k with respect to t_0.

The effect of $e^{-j\frac{2\pi k t_0}{T}}$ factor is it shifts the signal t_0 right so

$$y(t) = x(t - t_0)$$

Part C:

→ Required change is I need to multiply the formula derived in Part 2 with $j\frac{k2\pi}{T}$.

• By doing this operation, I take the derivative of $x(t)$ so, $y(t) = \frac{dx(t)}{dt}$

Part d:

→ By defining y_k, the complex conjugate of X_k and symmetry of x_k is taken with respect to the y-axis simultaneously

In order to achieve this, following code should be written in the for loop which is iterating through $-k$ to k.

```
if k > 0
    Xk(2*K + 1 - k) = ...
elseif k < 0
    Xk(-k) = ...
else
    Xk(1*K+1) = 0
```

! Corresponding plots to these parts are given below!