# M902
# Βασικές Μαθηματικές Έννοιες
# στη Γλωσσική Τεχνολογία

# Project 2

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# Question 1

The composite function $S(f(x))$ where $S(x) = \dfrac{1}{1 + e^{-x}}$ and $f(x) = ax + b$, is calculated as follows:

$$S(f(x)) = \frac{1}{1 + e^{-f(x)}} = \frac{1}{1 + e^{-(ax+b)}} = \frac{1}{1 + \dfrac{1}{e^{(ax+b)}}} = \frac{1}{\dfrac{e^{(ax+b)} + 1}{e^{(ax+b)}}} = \frac{e^{(ax+b)}}{e^{(ax+b)} + 1} = \frac{e^{ax}e^{b}}{e^{ax}e^{b} + 1}$$
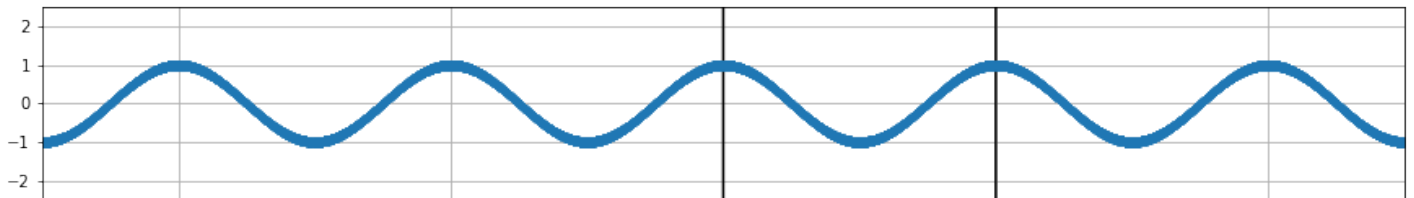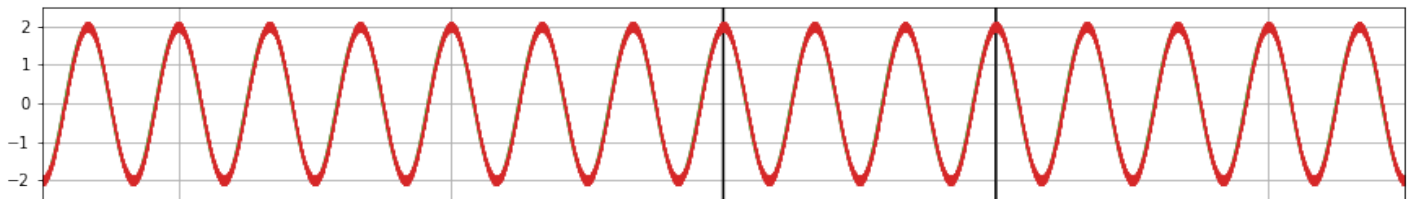
# Question 2

# Question 3

(a) $A_1 = 1$,    $f = 1$,    $\theta = 0$,    $s_1 = \cos( 2\pi t )$
(b) $A_2 = 2$,    $f = 3$,    $\theta = 0$,    $s_2 = 2 \cos( 6\pi t )$
(c) $A_1 = 1.5$,  $f = 2$,    $\theta = \pi$,  $s_3 = 1.5 \cos( 4\pi t + \pi)$
(d) $A_1 = 2$,    $f = 0.5$,  $\theta = 0$,    $s_4 = 2 \cos( \pi t )$
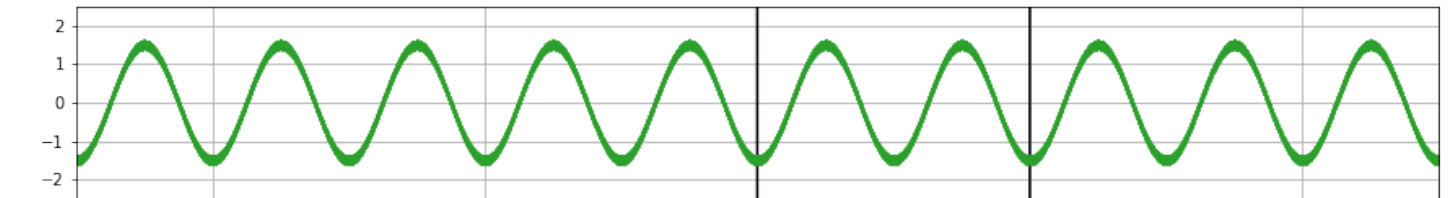


$A \cos(2\pi t + \theta)$
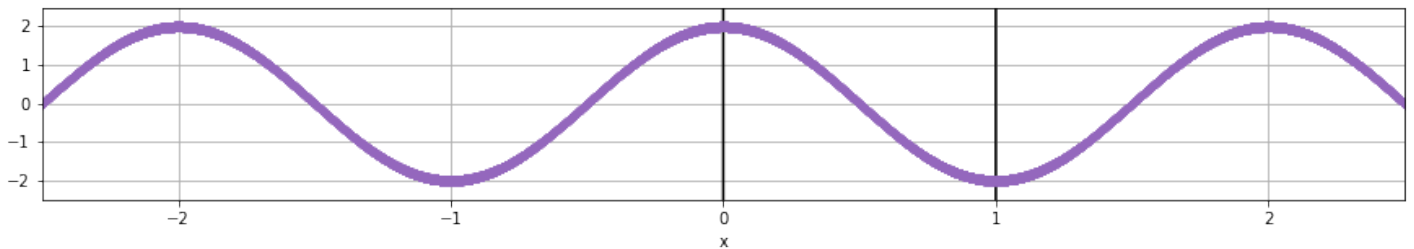
# Question 4

# Question 5

(a) The derivative of function $f(x) = ax^2$ is $f'(x) = 2ax$ ( $\mathbf{a} \to \mathbf{4}$ )

(b) The derivative of function $f(x) = cos(2\pi ft)$ is $f'(x) = -sin(2\pi ft)$ ( $\mathbf{b} \to \mathbf{1}$ )

(c) The derivative of function $f(x) = bx^3$ is $f'(x) = 3bx^2$ ( $\mathbf{c} \to \mathbf{2}$ )

(d) The derivative of function $f(x) = e^{cx}$ is $f'(x) = ce^{cx}$ ( $\mathbf{d} \to \mathbf{3}$ )

# Question 6

# Question 7

# Question 8

# Question 9

# Question 10