

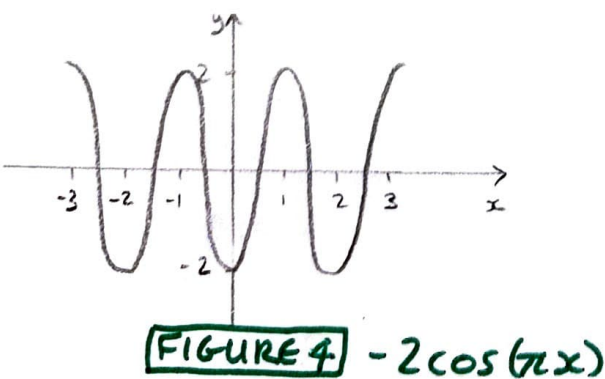
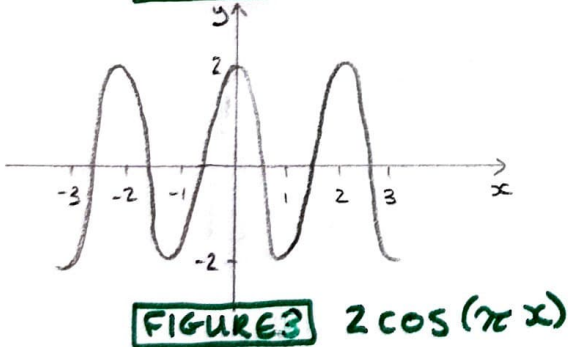
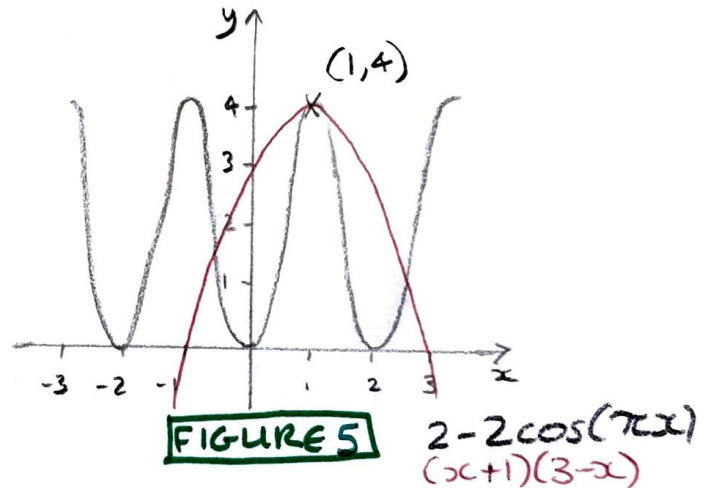
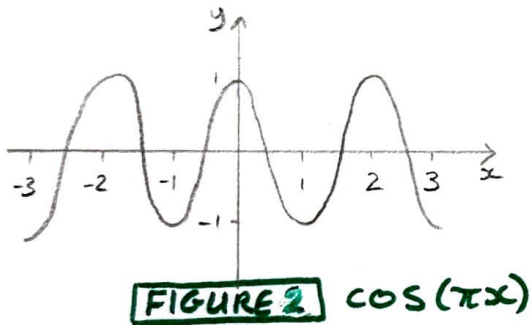
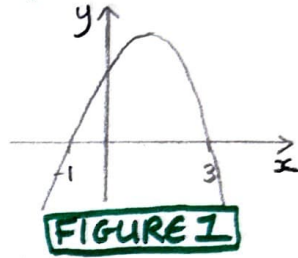
TMUA 2021 Paper 1 Question 14

This question uses radians.

Find the number of distinct values of x that satisfy the equation

$$(x + 1)(3 - x) = 2(1 - \cos(\pi x))$$

- A 2 The left hand side (LHS) of the equation is a quadratic with negative coefficient of x^2 and roots at $x = -1$ and $x = 3$
- B 3 FIGURE 1 shows a sketch of this. Completing the square will give us the maximum point
- C 4 I have, $(x+1)(3-x) = -x^2 + 3x - x + 3$
- D 5 $= -(x^2 - 2x - 3)$
- E 6 $= -(x-1)^2 + 4$
- F 7 Which shows that the maximum is at coordinate point $(1, 4)$



The graph of the right hand side (RHS) of the equation can be built up in stages. FIGURES 2-5 demonstrate this (note: $2(1 - \cos(\pi x)) = 2 - 2\cos(\pi x)$)

FIGURE 5 shows that the graphs of LHS and RHS intersect 3 times, this is equivalent to the number of distinct values of x that satisfy $(x+1)(3-x) = 2(1 - \cos(\pi x))$

so the correct answer is B