

Student 1 Roll No. _____

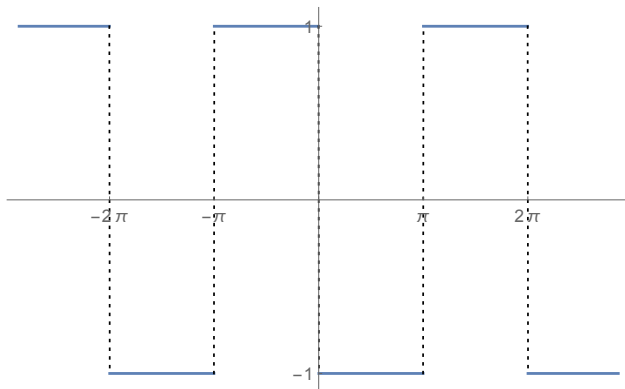
Evaluator 1 Roll No. _____

Student 2 Roll No. _____

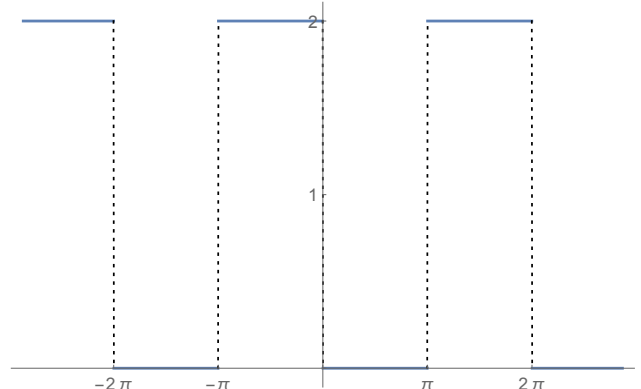
Evaluator 2 Roll No. _____

Problem 1

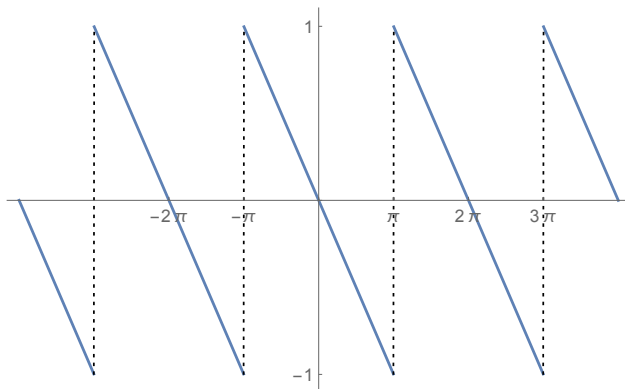
For each of the following periodic functions,



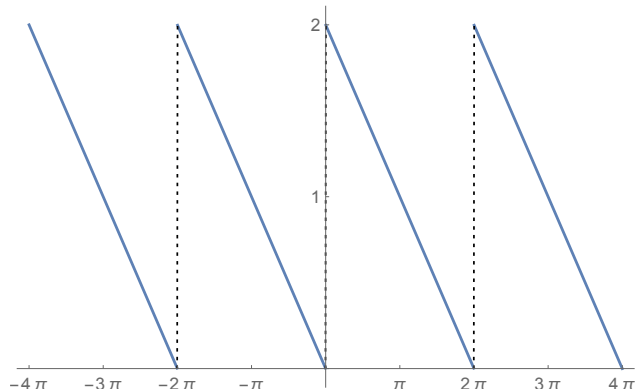
(a)



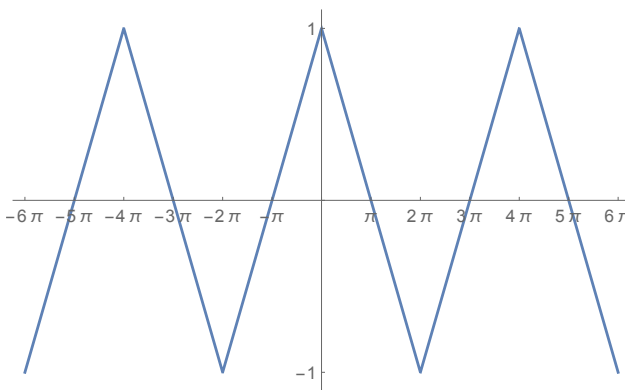
(b)



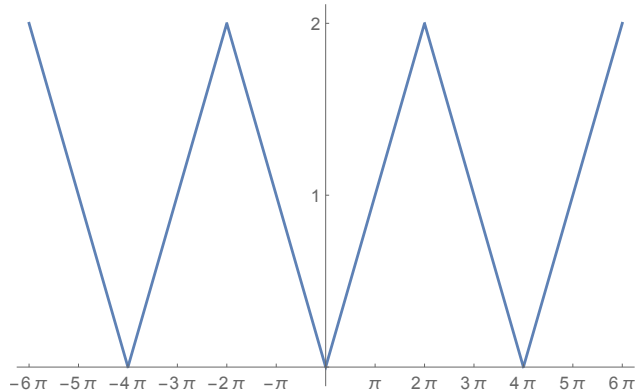
(c)



(d)



(e)



(f)

Figure 1: Periodic functions $f(t)$

- (i) Specify whether the above function is even or odd.
- (ii) Find its Fourier series.
- (iii) Find the particular solution of the following differential equations, if $f(t)$ is the input function of the differential equation.

$$(I) \quad y'' + 25y = f(t)$$

$$(II) \quad y'' + 5y' + 4y = f(t)$$

$$(III) \quad y'' - 2y' - 2y = f(t)$$

- (iv) For each differential equation in (iii), find its resonant frequency, where appropriate. For which inputs from (a)-(f) would resonance occur in each case? If not, which frequency will be most prominent at the output?
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