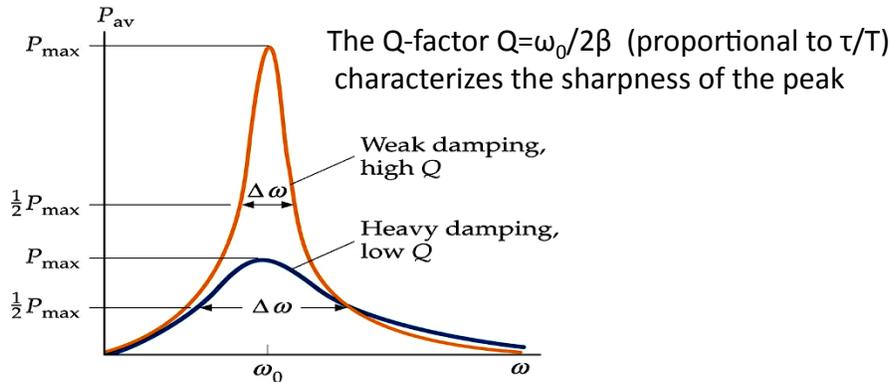


Driven Oscillations & Resonance



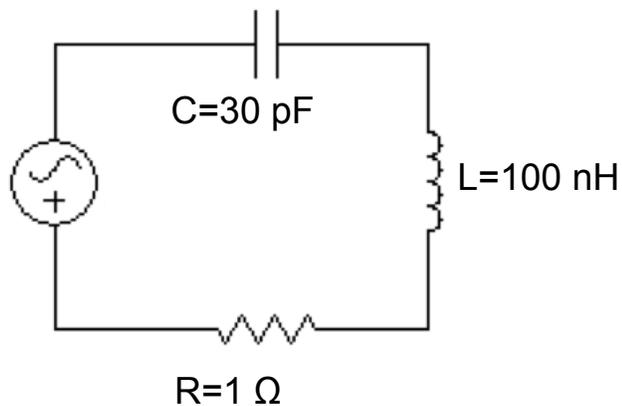
What is the (very) approximate Q of the simple harmonic oscillator shown in front of class?

- A) much less than 1 B) of order 1 C) Much greater than 1

2-

$$L \frac{d^2 Q}{dt^2} + R \frac{dQ}{dt} + \frac{Q}{C} = 0$$

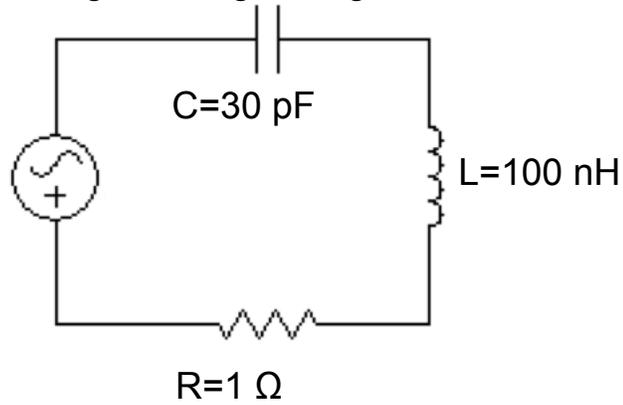
If we attach an AC voltage source of the circuit shown below, for what frequency do we get the maximum charge flowing through the circuit?



2- 6

$$\frac{d^2Q}{dt^2} + \frac{R}{L} \frac{dQ}{dt} + \frac{Q}{CL} = 0$$

If we attach an AC voltage source of the circuit shown below, for what frequency do we get the maximum charge flowing through the circuit?



2- 7

Fourier Series

2- 8

How many of the following are even functions?

I: x II: $\sin(x)$ III: $\sin^2(x)$ IV: $\cos^2(x)$

- A) None
- B) Exactly one of them
- C) Two of them
- D) Three of them
- E) All four of them!

2- 9

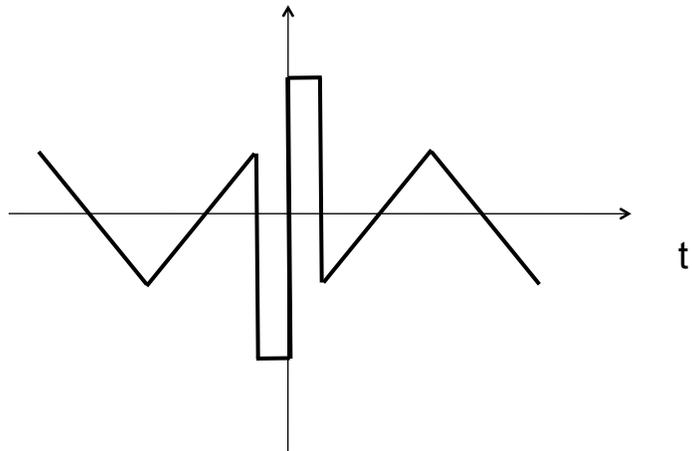
How many of the following are even functions?

I: $3x^2-2x^4$ II: $-\cos(x)$ III: $\tan(x)$ IV: e^{2x}

- A) None
- B) Exactly one of them
- C) Two of them
- D) Three of them
- E) All four of them!

2- 10

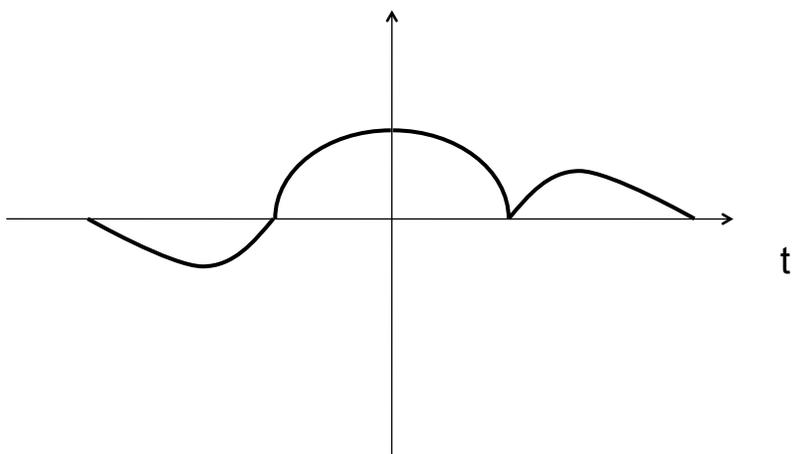
How would you classify this function?



A) Odd B) Even C) Neither

2-11

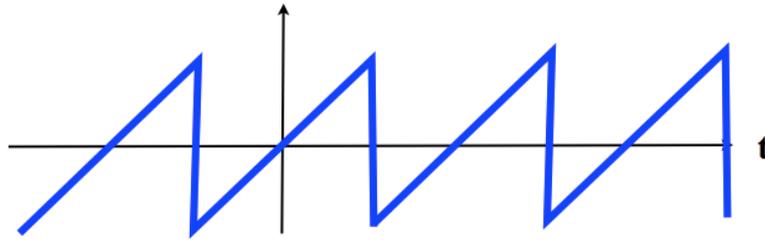
How would you classify this function?



A) Odd B) Even C) Neither

2-12

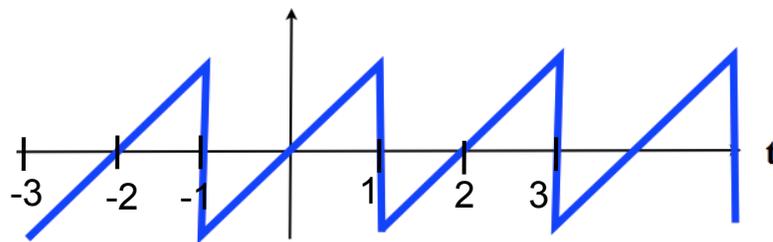
How would you classify this function?



- A) Odd B) Even C) Neither

2-13

What is the period, T , of this function?

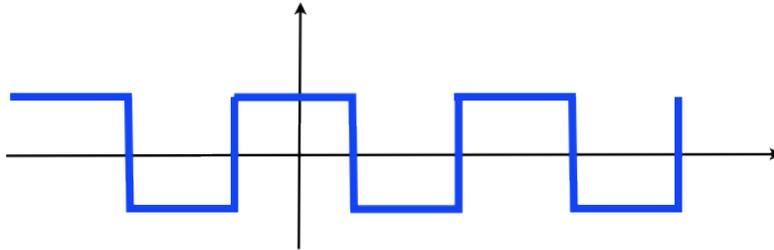


- A) 0.5 B) 1 C) 2
D) Something else! E) not determined!

2-14

$$f(t) = \sum_{n=0}^{\infty} a_n \cos n\omega t + b_n \sin n\omega t$$

What can you say about the a's and b's for this f(t)?

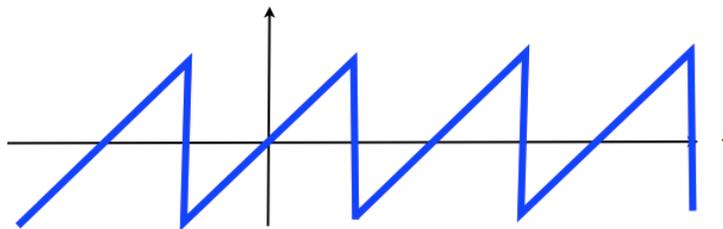


- A) All terms are non-zero B) The a's are all zero
 C) The b's are all zero D) a's are all 0, except a_0
 E) More than one of the above!

2-15

$$f(t) = \sum_{n=0}^{\infty} a_n \cos n\omega t + b_n \sin n\omega t$$

What can you say about the a's and b's for this f(t)?

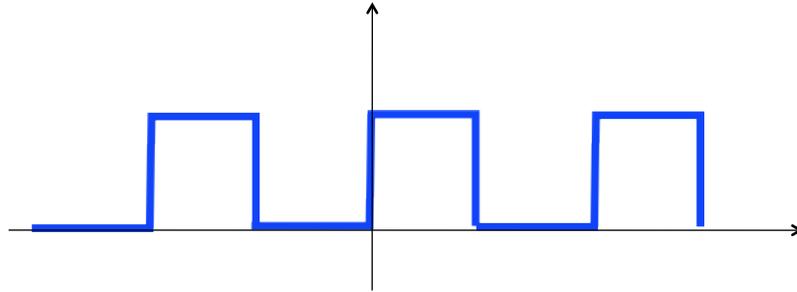


- A) All terms are non-zero B) The a's are all zero
 C) The b's are all zero D) a's are all 0, except a_0
 E) More than one of the above!

2-16

$$f(t) = \sum_{n=0}^{\infty} a_n \cos n\omega t + b_n \sin n\omega t$$

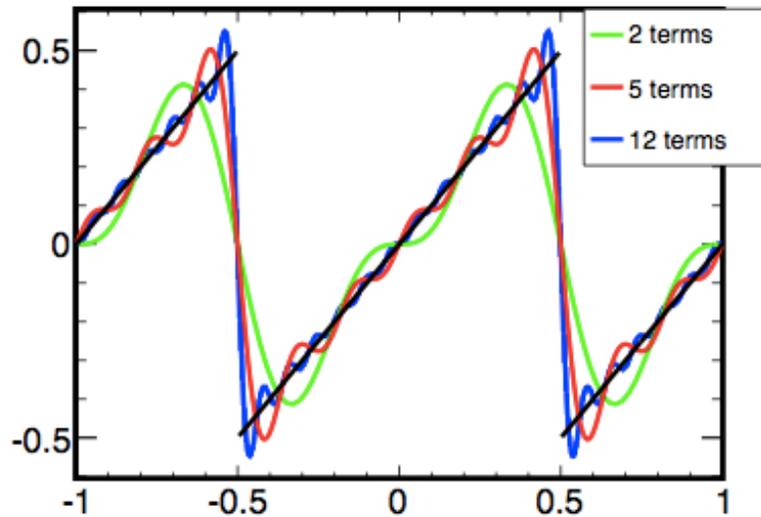
What can you say about the a's and b's for this f(t)?



- A) All terms are non-zero
- B) The a's are all zero
- C) The b's are all zero
- D) a's are all 0, except a_0
- E) More than one of the above!

2-17

Fourier Expansion of a Sawtooth



2-18