

## 2. Fourier series

### 1-2 (a)

1/1 point (graded)

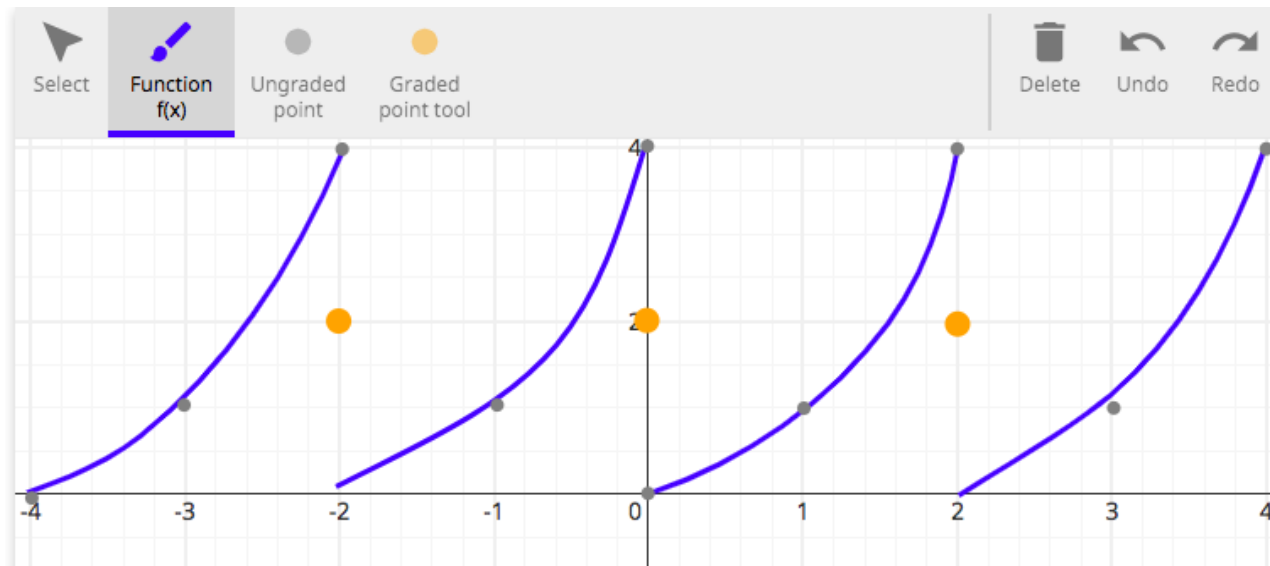
Consider the Fourier series of the function with period 2 given by  $t^2$  if  $0 < t < 2$ . The Fourier series for this function is

$$f(t) = \frac{4}{3} + \frac{4}{\pi^2} \sum_{n=1}^{\infty} \frac{\cos(n\pi t)}{n^2} - \frac{4}{\pi} \sum_{n=1}^{\infty} \frac{\sin(n\pi t)}{n}.$$

Graph  $f(t)$  on  $-4 < t < 4$ . Drop a point at the  $t = 2$ ,  $t = 0$ , and  $t = -2$  to show what value the Fourier series evaluates to.

(Note that the horizontal axis is the  $t$  axis. Use the **Ungraded point tool** to drop points that will help you sketch your function. Use the **Graded point tool** to label the values of the Fourier series  $f(t)$  at  $t = -2$ ,  $t = 0$ , and  $t = 2$ .)





Submit

You have used 7 of 25 attempts

**i** Answers are displayed within the problem

1-2 (b)

3/3 points (graded)

Find the coefficients of the Fourier series of the function  $h$  with period  $2\pi$  such that  $h(t) = 1 + t^2$  on  $0 < t < 2\pi$ .

*Hint: Use the formula for  $f(t)$  in the problem above.*

$a_0/2 =$

$1 + 4\pi^2/3$

✓ Answer:  $1 + 4\pi^2/3$

$1 + \frac{4\pi^2}{3}$



$a_n =$   ✓ Answer:  $4/n^2$

$b_n =$   ✓ Answer:  $-4\pi/n$

[FORMULA INPUT HELP](#)

**Solution:**

We note that

$$h(t) = 1 + \pi^2 f(t/\pi), \quad 0 < t < 2\pi.$$

Making the appropriate substitution into the Fourier series for  $f(t)$ , we find

$$h(t) = 1 + \frac{4\pi^2}{3} + 4 \sum_{n=1}^{\infty} \frac{\cos(nt)}{n^2} - 4\pi \sum_{n=1}^{\infty} \frac{\sin(nt)}{n}.$$

Submit

You have used 1 of 5 attempts

**i** Answers are displayed within the problem

## 2. Fourier series

**Topic:** Unit 1: Fourier Series / 2. Fourier series

[Hide Discussion](#)



[◀ All Posts](#)1.2(a) asks to plot value of  $f$  at  $t = -2, 0$  and  $2$  right?question posted 21 days ago by [gmautner](#)

It seems pretty clear that the value of the Fourier series is the midpoint of the discontinuity, that is, the points that should be plotted by the Graded Point Tool should be  $(-2, 2)$ ,  $(0, 2)$  and  $(2, 2)$ . I double checked that the series actually converges to these values. But the grader responds to this as incorrect and gives a mysterious feedback: "Check the values of your function at the odd integer values of  $t$ ." I don't get it.

This post is visible to everyone.

[Add a Response](#)

1 response

**jfrench** (Staff)

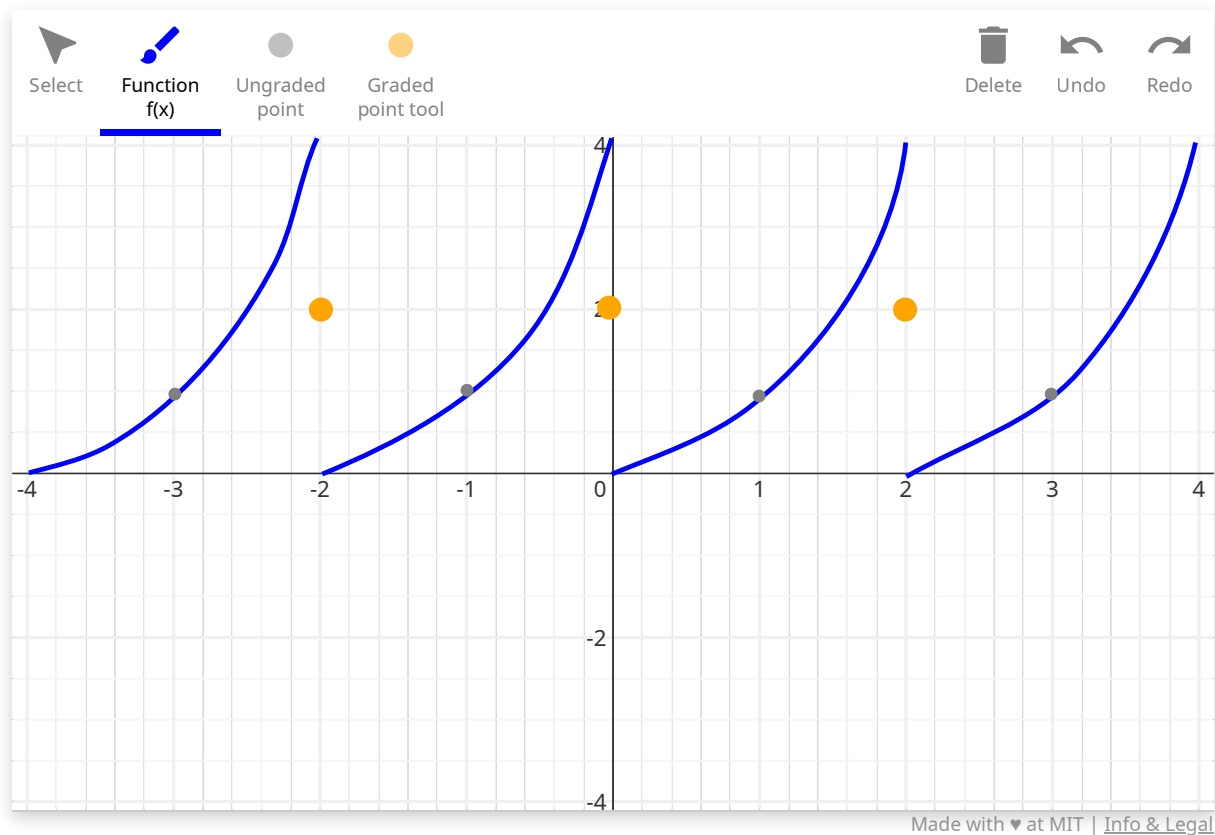
21 days ago

Are you sketching the function in between these points? The issue is not with your point tool, but the value of the function in between. :)

Showing all responses

Add a response:





Answer: .



Good job!

**Solution:**

This period 2 function repeats the curve  $f(t) = t^2$ . The Fourier convergence theorem tells us that the value at  $t = -2$ ,  $t = 0$ , and  $t = 2$ , where the function has jump discontinuities is the value between the jump. Thus the value at these points is 2.



Preview

Submit

