

Task 01.01

1)

f_0	f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	f_9	f_{10}	f_{11}	f_{12}
2	-1	1	-1	2	-1	1	-1	2	-1	1	-1	
1	1	1	2	3	3	2	4	5	5	3	6	

numerator } 2 -1 1 -1 2 -1 1 -1 2 -1 1 -1

seems to change from 2 and -1

rewrite

$\frac{2}{1}$	$\frac{-1}{1}$	$\frac{2}{2}$	$\frac{-1}{2}$	$\frac{2}{3}$	$\frac{-1}{3}$	$\frac{2}{4}$	$\frac{-1}{4}$	$\frac{2}{5}$	$\frac{-1}{5}$	$\frac{2}{6}$	$\frac{-1}{6}$
1	2	3	4	5	6	7	8	9	10	11	12

denominator } 1 2 3 4 5 6

+1 on odd number
even is the same as previous

equation for numerator : 2 -1 2 ...

$(-1)^{n+1}$ $2^{n/2}$ when odd $2^1 = 2$
alternating sign when even $2^0 = 1$

equation for denominator :

1	1	2	2	3	3	4	4	...
1		2		3		4		

only add when odd
 $\frac{1}{4}(2n + (-1)^{n+1} + 1)$
adds when n is odd
cancels the (-1) when even
increases the value
simplifies

together

$$\frac{(-1)^{n+1} \cdot 2^{n/2}}{\frac{1}{4}(2n + (-1)^{n+1} + 1)}$$

simplify :

$$\frac{4[(-1)^{n+1} \cdot 2^{n/2}]}{2n + (-1)^{n+1} + 1}$$

Test

$$f_1 = \frac{4[(-1)^2 \cdot 2^{1/2}]}{2(1) + (-1)^{1+1} + 1} = \frac{4 \cdot 2}{4} = 2 \quad \checkmark \text{ expected } 2$$

$$f_2 = \frac{4[(-1)^3 \cdot 2^0]}{2(2) + (-1)^{2+1} + 1} = \frac{4(-1)}{4} = -1 \quad \checkmark \text{ expected } -1$$

$$f(3) = \frac{4[(-1)^4 \cdot 2]}{6 + 1 + 1} = \frac{8}{8} = 1 = 1$$

$$f(6) = \frac{4[(-1)^7 \cdot 2]}{12 - 1 + 1} = \frac{4(-1)}{12} = -\frac{1}{3} = -\frac{1}{3}$$

$$f(9) = \frac{4[(-1)^9 \cdot 2]}{19 + 1 + 1} = \frac{8}{16} = \frac{1}{2} = \frac{1}{2}$$

2) wrote a python program to calculate the sum and used TI-nspire to confirm

$$\sum_{n=1}^{1,000} \frac{4[(-1)^{n+1} \cdot 2^{n/2}]}{2n + (-1)^{n+1} + 1} \approx 6.7928$$

3) $f(-2.7)$

$$\frac{4[(-1)^{(-2.7)+1} \cdot 2^{(-2.7)+2}]}{2(-2.7) + (-1)^{(-2.7)+1} + 1} = \frac{4[(-1)^{-1.7} \cdot 2^{-0.7}]}{2(-2.7) + (-1)^{-1.7} + 1}$$

The result is not a real #

$$\frac{4\left[\frac{1.3}{(-1)^{1.7}}\right]}{-5.4 + \frac{1}{(-1)^{1.7}} + 1} \Rightarrow \frac{4\left[1.3 \cdot \frac{1}{i}\right]}{-4.4 + \frac{1}{i}}$$

$$\Rightarrow \frac{-5.2i}{-4.4 - i} = \boxed{\frac{5.2i}{4.4 + i}}$$

$$\begin{aligned} & \frac{10 \sqrt[10]{(-1)^{10}}}{\sqrt[10]{(-1)^{10} (i)^5}} \\ & \frac{1 \cdot \sqrt[10]{(-1)^5}}{1 \cdot \sqrt[10]{(-1)^5} = (-1)^{1/2}} \\ & (-1)^{1/2} = i \end{aligned}$$