$t\cos(2t) + 4$

Switched on from $t = 7$ to $t = 13$

$(t-7)\cos(2(t-7)) + 4$

$[u(t-7) - u(t-13)]$

$g(t)u(t-a) \longrightarrow e^{-as}\mathcal{L}\{g(t+a)\}$

$\underbrace{(t-7)\cos(2(t-7)) + 4]}_{g(t)}\, u(t-7)$

$$e^{-7s}\mathcal{L}(g(t+7))$$

$g(t+7) = (t - \cancel{7} + \cancel{7})\cos(2(t - \cancel{7} + \cancel{7}))4$

$$t\cos 2t \xrightarrow{\mathcal{L}} -\frac{d}{ds}\mathcal{L}\{\cos 2t\}$$

$$= -\frac{d}{ds}\frac{s}{s^2+4}$$

$$= -\frac{(1)(s^2+4) - s(2s)}{(s^2+4)^2}$$

$$= -\frac{-s^2+4}{(s^2+4)^2}$$

Don't forget the Four!

$$4 \mathcal{L} \rightarrow \frac{4}{s}$$

$$\left(\frac{s^2-4}{(s^2+4)^2} + \frac{4}{s}\right)e^{-7s}$$

Now for the Case

$$\underbrace{(t-7)\cos(2(t-7))+4]}_{g(t)}\, u(t-13)$$

$$g(t+13) = (t+6)\cos(2t+12)+4$$

$$= (t+6)\underbrace{\cos 2t \cos 12 - \sin 2t \sin 12}\ +4$$

Multiply that out. you'll have a constant term, and a t term.

Inversion problem

$$e^{-7s}\frac{s+1}{s^2(s+2)^2}$$

$$\frac{s+1}{s^2(s+2)^2} = \frac{A}{s} + \frac{B}{s^2} + \frac{C}{(s+2)} + \frac{D}{(s+2)^2}$$

$$B = \frac{0+1}{(0+2)^2} = \frac{1}{4}$$

$$D = \frac{-2+1}{(-2)^2} = -\frac{1}{4}$$

.....

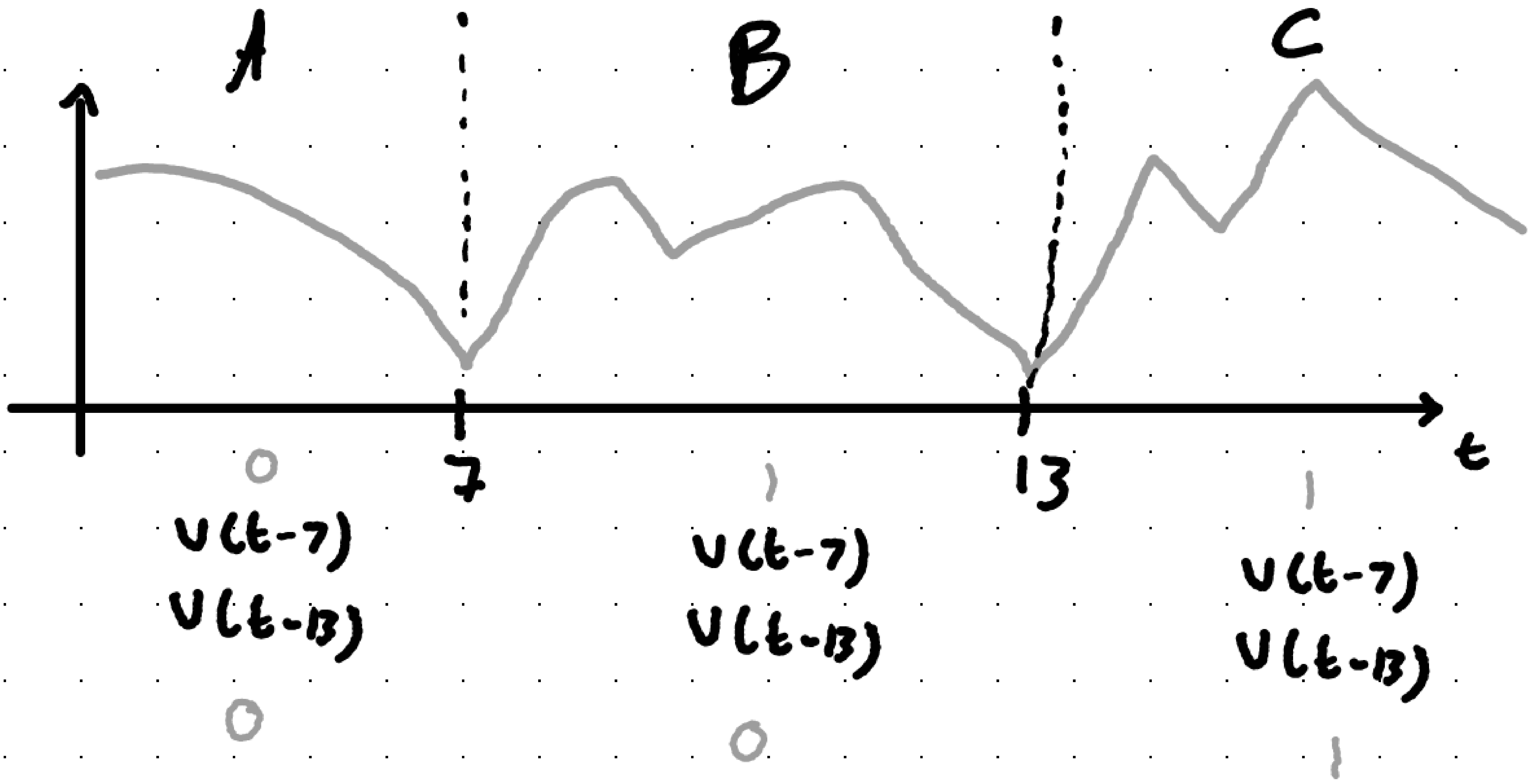
And so on.

Now, we need to do the other transform.

$$e^{-as}F(s) \rightarrow U(t-a)\,f(t)$$

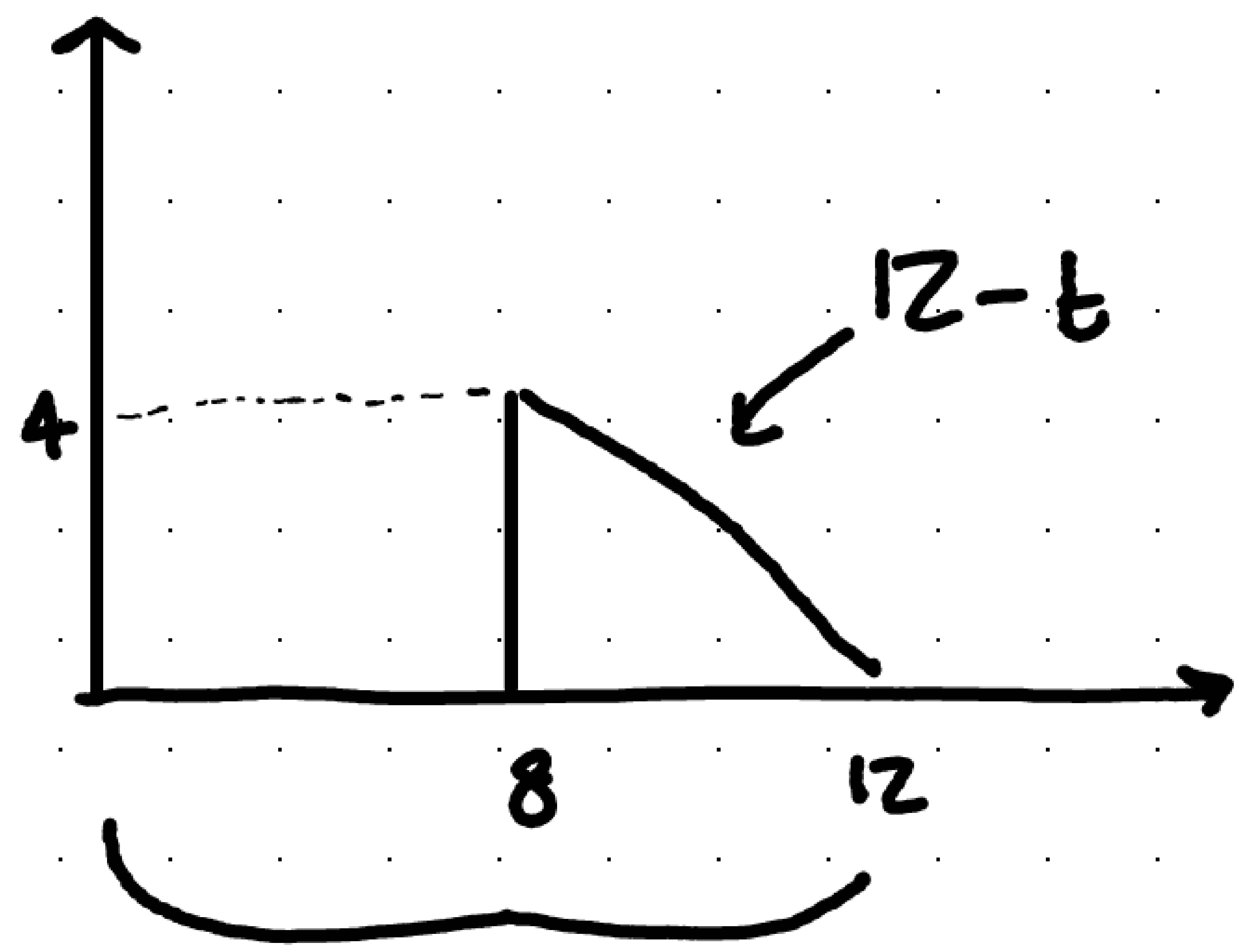
Sketching

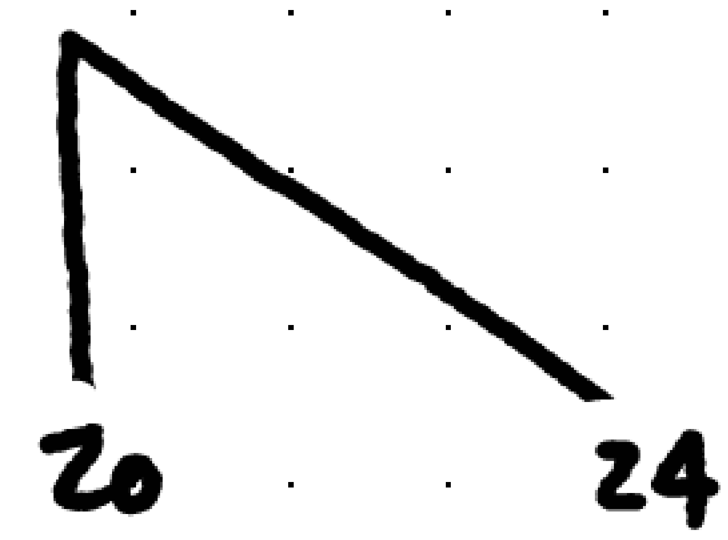
$$u(t-7)\,f_1(t-7) - u(t-13)\,f_2(t-13)$$



Zone Edges

Fourier





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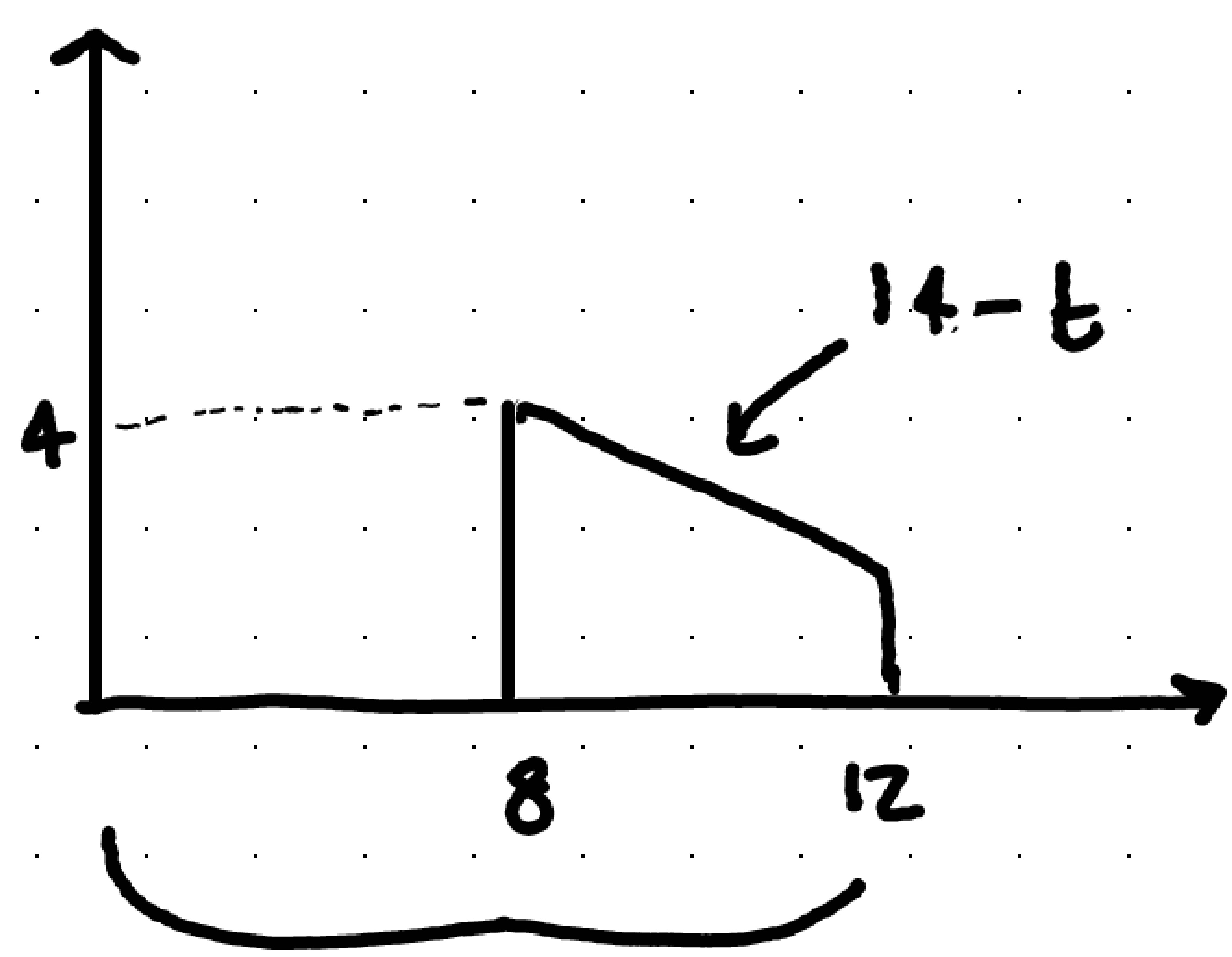
L = 6



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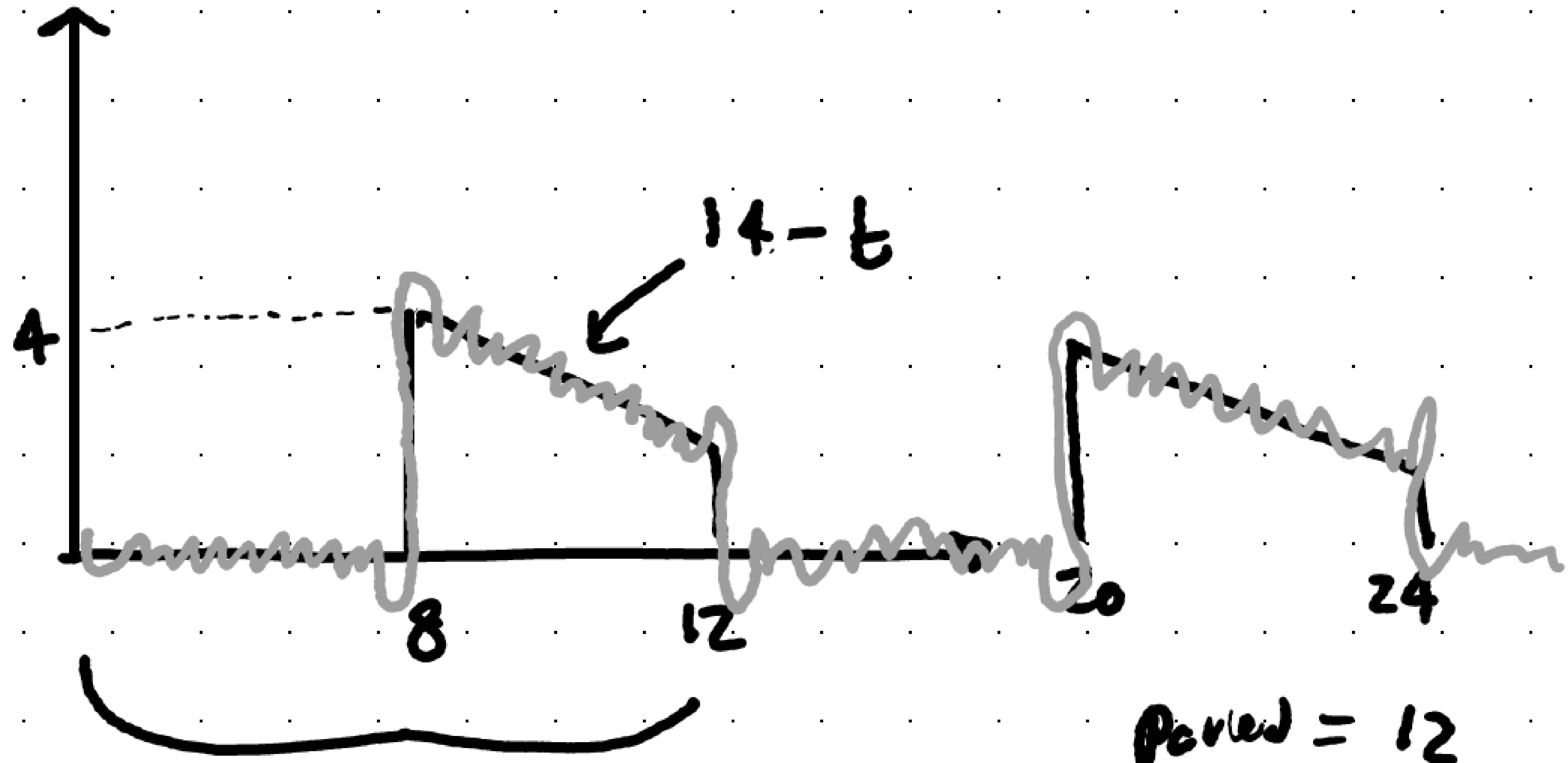
L = 6



period = 12

L = 6

Gibbs phenomena!

All the little jumps!

$$
\begin{cases}
f(t) = 14 - t & \text{on } 8 \leq t \leq 12 \\
 = 0 & \text{else where in } 0 < t < 12 \\
2t \quad \text{parabola} & \\
12 - \quad \text{parabola} &
\end{cases}
$$