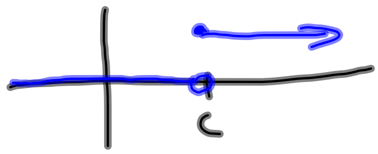
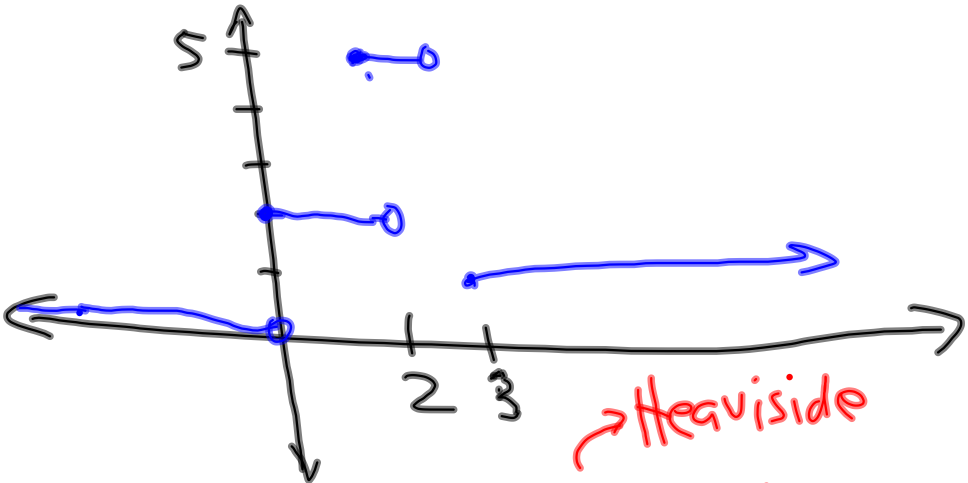
Given: $u(t-c) = \begin{cases} 0 & \text{if } t < c \\ 1 & \text{if } t \geq c \end{cases} \qquad c > 0$

Sketch the graph of



t	$u(t)$
$c-2$	0
$c-1$	0
c	1
$c+1$	1
$c+2$	1

$f(t) = 2\underline{u(t)} + 3\underline{u(t-2)} - 4\underline{u(t-3)}$

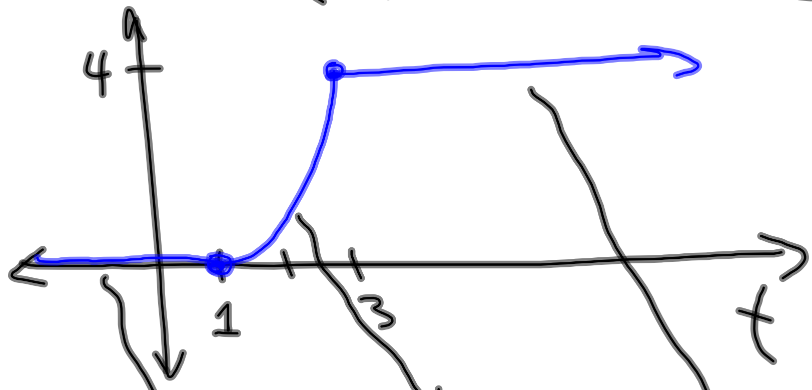


Heaviside

$u(t-c) = u_c(t) = \underline{H(t-c)}$

Wolfram

$$f(t)=\begin{cases}0 & t<1\\ (t-1)^2 & 1\le t<3\\ 4 & \text{if } t\ge 3\end{cases}$$

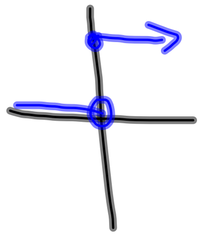


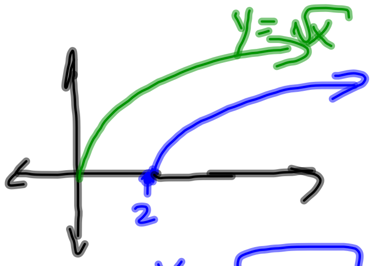
$$f(t)=0+(t-1)^2\left[u_1(t)-u_3(t)\right]+4u_3(t)$$

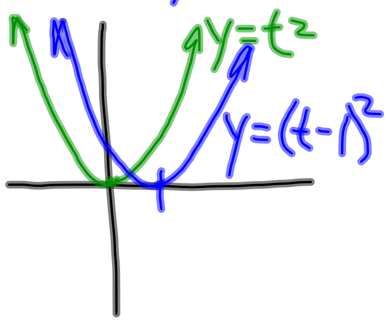
$$f(t)=(t-1)^2u_1(t)-\left[(t-1)^2-4\right]u_3(t)$$

$$f(t)=(t-1)^2u(t-1)-\left[(t-1)^2-4\right]u(t-3)$$

match



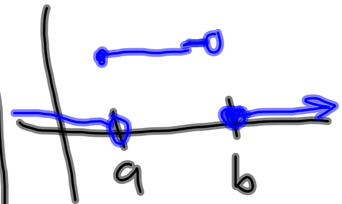


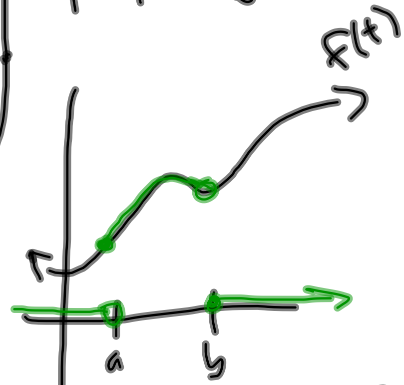


$0\le a<b$

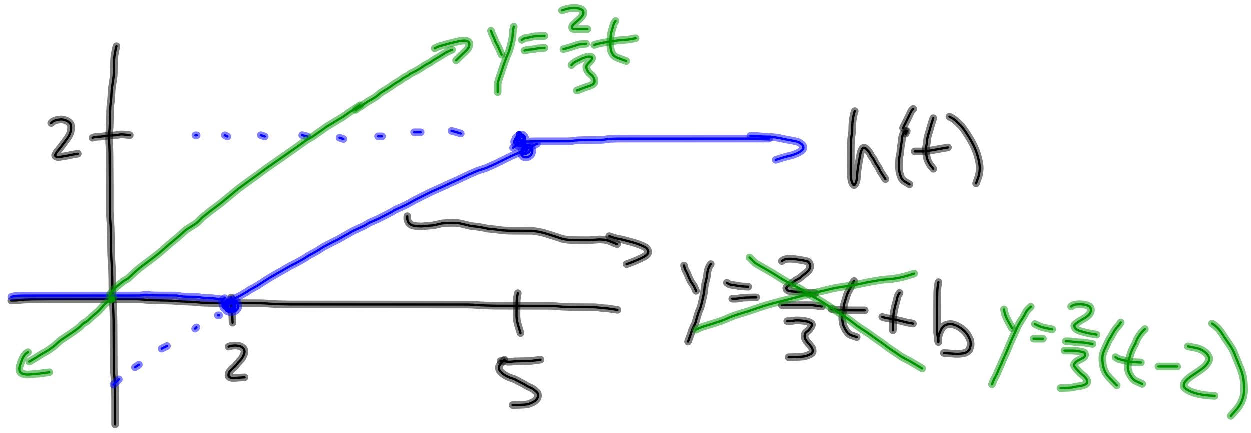
$u(t-a)-u(t-b)$

box fuction





$f(t)\left[u(t-a)-u(t-b)\right]$



$$h(t)=\underline{\underline{\tfrac{2}{3}(t-2)}}\left[u(t-2)-u(t-5)\right]\ +2u(t-5)$$

$$=\tfrac{2}{3}(t-2)u(t-2)-\tfrac{2}{3}(t-2)u(t-5)+2u(t-5)$$

$\mathcal{L}\{t\,u(t-5)\}$

$$=\underbrace{\tfrac{2}{3}(t-2)u(t-2)}+\left[-\tfrac{2}{3}t+\tfrac{4}{3}+2\right]u(t-5)$$

$$=\qquad\qquad\qquad+\left(-\tfrac{2}{3}t+\tfrac{10}{3}\right)u(t-5)$$

$f(t)=\frac{2}{3}t$ $\qquad$ $f(t)=\frac{2}{3}t$

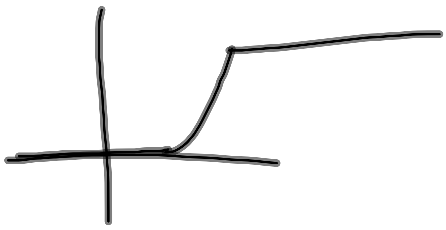
$$=\tfrac{2}{3}(t-2)u(t-2)-\tfrac{2}{3}(t-5)u(t-5)$$

Good! $\qquad$ Good!

$c=2$ $\quad F(s)=\frac{2}{3s^2}$ $\qquad$ $c=5$ $\quad F(s)=\frac{2}{3s^2}$

$$H(s)=e^{-2s}\cdot\frac{2}{3s^2}-e^{-5s}\cdot\frac{2}{3s^2}$$

$$=\frac{2}{3s^2}\left(e^{-2s}-e^{-5s}\right)$$



$$f(t) = (t-1)^2 u(t-1) - \underbrace{\left[(t-1)^2 - 4\right]} u(t-3)$$

$$\left[(t-3)+2\right]^2 - 4 \qquad (a+b)^2 = a^2 + 2ab + b^2$$

$$(a+b)^2$$

$$(t-3)^2 + 4(t-3) + \cancel{4} - \cancel{4}$$

$$f(t) = (t-1)^2 u(t-1) - \left[\underbrace{(t-3)^2 + 4(t-3)}_{f(t-3),\ \text{where } f(t) = t^2 + 4t}\right] u(t-3)$$