Pre-class activity week 2 micro

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Sue's budget

Read the following narrative and in a graph measuring carrots along the horizontal axis and soda along the vertical axis draw Sue's budget set. What is the expression of Sue's budget constraint?
Sue has $10 to buy soda and carrots. Soda costs $1 per bottle. Carrots cost $1 per pack for the first four packs and $2 per pack afterwards.

Solution We can start by making a table of values if we want:

Soda	Carrots
10	0
9	1
8	2
7	3
6	4
4	5
2	6
0	7

From this, we can concluse that we need to describe the function piecewise, with the first line being from $x = 0$ to $x = 4$. When $x = 4$, the carrots cost more so the slop is greater.

Therefore, from $x = 0$ to $x = 4$, the formula is

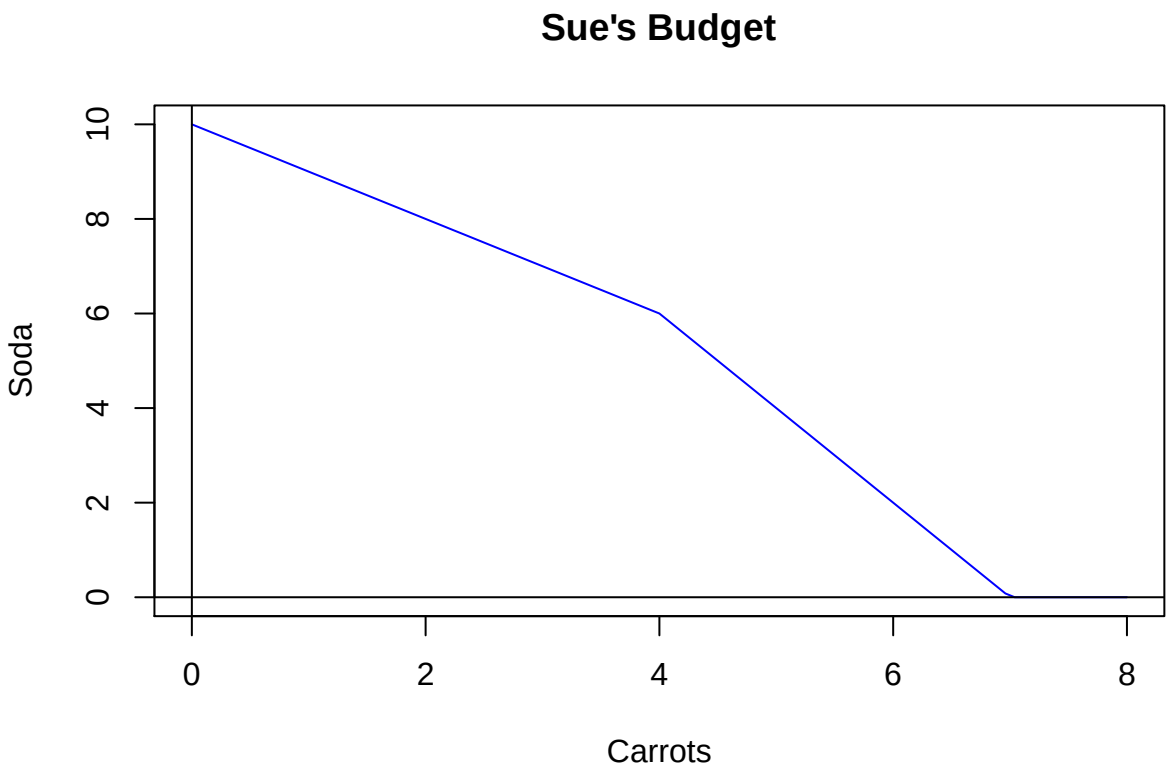
$$10 - x$$

meaning that with 0 carrots ($x = 0$), Sue buys 10 sodas. She can trade off one soda for one carrot up until $x = 5$. At $x = 5$, carrots are now costing two sodas, or $2 dollars each, meaning the rate (or slope) doubles for $-x$ to $-2x$. Together:

$$B_S = \begin{cases} 10 - x & \text{for } 0 \leq x \leq 4 \\ 14 - 2x & \text{for } 4 \leq x \leq 7 \end{cases}$$

As a graph:

```
func <- function(x){(0 <= x & x < 4)*(10-x)+(4 <= x & x < 7)*(14-2*x)}
vectFunc <- Vectorize(func)
plot(vectFunc,0,8, type = "l", col = "blue", ylab = "Soda", xlab = "Carrots", main = "Sue's Budget")
abline(v = 0, h = 0)
```


Sue's Budget
Soda
0
2
4
6
8
10
0
2
4
6
8
Carrots