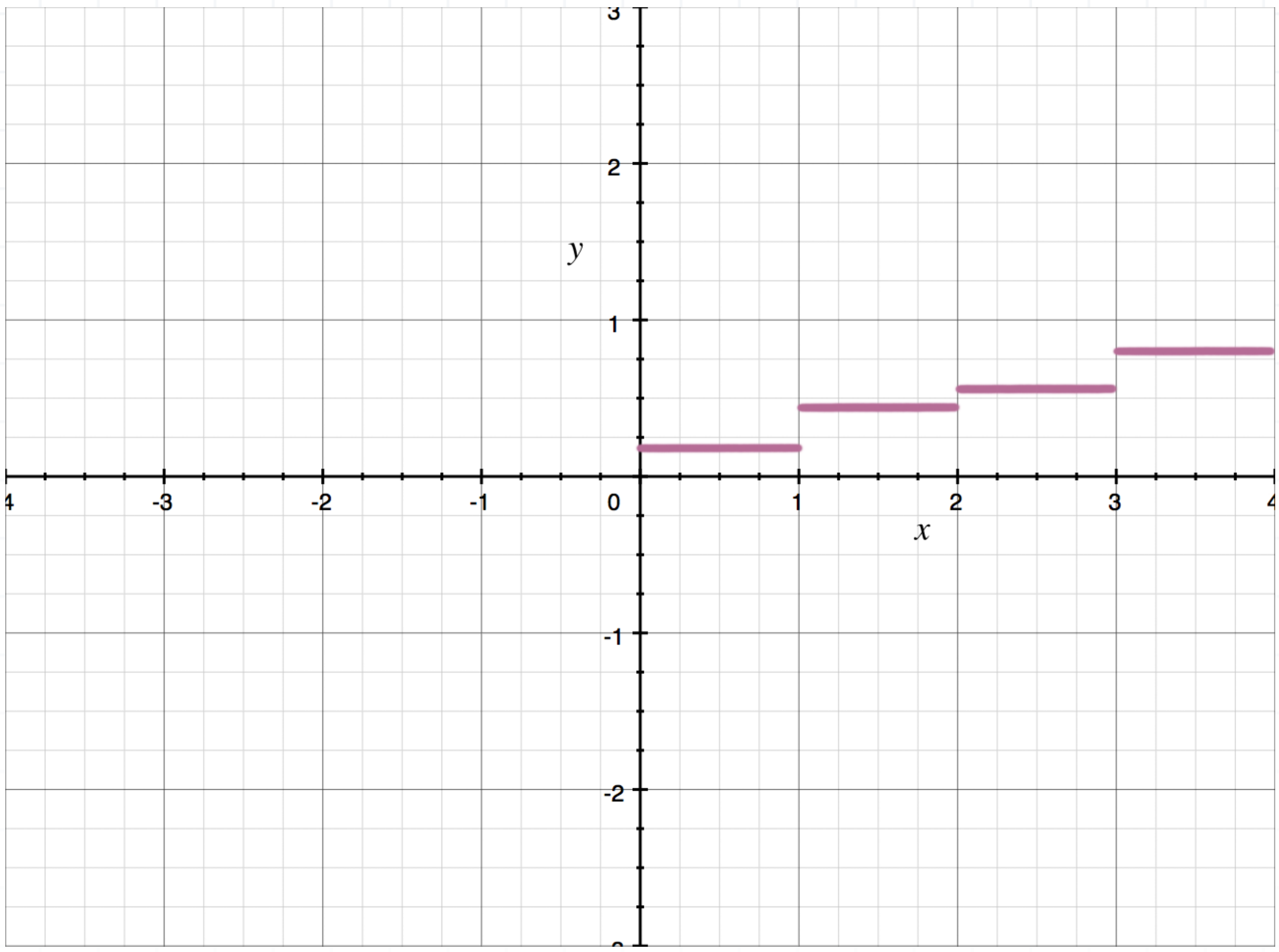
Jump discontinuities

We'll usually encounter **jump discontinuities** with piecewise-defined functions, which are functions for which different parts of the domain are defined by different expressions.

For instance, we might define the cost of postage as a function. If the cost per ounce of any package lighter than 1 pound is 20 cents per ounce, the cost of every ounce from 1 pound to anything less than 2 pounds is 40 cents per ounce, etc., the piecewise function that defines the cost of postage might be

$$f(x) = \begin{cases} 0.2 & 0 < x < 1 \\ 0.4 & 1 \le x < 2 \\ 0.6 & 2 \le x < 3 \\ 0.8 & 3 \le x < 4 \\ 1.0 & 4 \le x \end{cases}$$

The graph of this piecewise function would be



Every break in this graph is a jump discontinuity. We can remember that these are jump discontinuities if we imagine walking along on top of the first segment of the graph. In order to continue, we'd have to jump up to the second segment, then jump to the third segment, etc.

The general limit never exists at a jump discontinuity because, while the left- and right-hand limits both exist, there not equal to one another.