Recap

"Outside" transformations do what they say to y.
"Inside" transformations do the opposite of what they say to x.

E.g. Describe fully the following transformation

\[ f(x) \rightarrow 3 + f(2x) \]

Translate \((\frac{0}{3})\) then Stretch S.F. \(\frac{1}{2}\) parallel to \(x\)-axis

or Stretch S.F. \(\frac{1}{2}\) parallel to \(x\)-axis then translate \((\frac{3}{0})\)

Notice in the above example the order of transformations being performed doesn't matter. Since one is in the \(x\)-direction and one in the \(y\)-direction, they are independent of each other.

E.g. Describe fully the transformation that transform \(y = e^x\) to \(y = 5e^x + 3\).

Note: order is important as both transformations are in the \(y\)-direction.

First, \(\times 5\) : Stretch by S.F. 5 parallel to \(y\)-axis

Next, \(+3\) : Translate \((\frac{0}{3})\)
e.g. Describe fully the transformations that transform 
\[ y = f(x) \rightarrow y = 3f(2x + 3) \]

Note here there are 3 separate transformations:

Two are "inside" and for "inside" transformations, the usual order is reversed.

Stretched by S.F. 3 parallel to y-axis
Translate \((-\frac{3}{6})\)

Stretched by S.F. \(\frac{1}{2}\) parallel to x-axis

\(x\) transformations in opposite order to BIDMAS

y independent of the two \(x\)-transformations so can be placed anywhere in this example.

Q1. (Jun 2005, Q9 [Modified])

The function \(f\) is defined by \(f(x) = \sqrt{mx + 7} - 4\), where \(x \geq -\frac{7}{m}\) and \(m\) is a positive constant.

(i) A sequence of transformations maps the curve \(y = \sqrt{x}\) to the curve \(y = f(x)\). Give details of these transformations. [4]

- Translate \((-\frac{7}{6})\)
- Stretch by S.F. \(\frac{1}{m}\) parallel to x-axis
- Translate \((-4)\)