2.3 Proof of Drag Translation

Step 1. Define pixel displacement
When the mouse moves from **(dragStartX, dragStartY)** to **(e.getX(), e.getY())**

The displacement in screen coordinates is:

$$d_x = dragStartX - e.getX()$$

$$d_y = dragStartY - e.getY()$$

These are measured in pixels.

Step 2. Convert displacement into fractional ratios
Relative to screen size:

$$f_x = d_x / SCREEN\_WIDTH$$

$$f_y = d_y / SCREEN\_HEIGHT$$

Step 3. Convert fractions into complex-plane shift
Since the width and height of the complex window are:

$$W = x_{max} - x_{min}$$

$$H = y_{max} - y_{min}$$

the corresponding shifts in the complex plane are:

$$\Delta x = f_x \cdot W = d_x / SCREEN\_WIDTH \cdot (x_{max} - x_{min})$$
$$\Delta y = f_y \cdot H = d_y / SCREEN\_HEIGHT \cdot (y_{max} - y_{min})$$

Step 4. Apply translation to boundaries
For the x-axis, increasing screen dx means we move right, so:

$$x_{min} = x_{min} + \Delta x,$$

$$x_{max} = x_{max} + \Delta x$$

For the y-axis, note: **screen y grows downward**, but in the complex plane, y grows upward. Therefore, we subtract:

$$y_{min} = y_{min} - \Delta y$$

$$y_{max} = y_{max} - \Delta y$$