Exercise 10

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1) If you change the value of c to a low value, the plot does not appear to move and if you change it to a much higher value, the plot appears as a straight line.

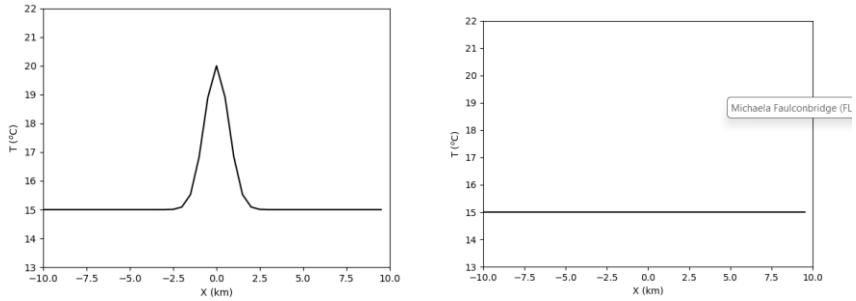

Figure 1: c value of A) 0 m/s and B) 100 m/s

When the c value is zero, the advection speed is zero and thus there is no advection, so the Gaussian shape remains constant in time. When the c value is equal to 100, the speed is rapid, and the Gaussian plot is advected to the right faster than the analytical solution can capture. More transport occurs in less time.

Changing the value of dx changes the roundness of the peak. Changing the dx to 100 rounds the peak because the spatial intervals are smaller, thus making the Gaussian approximation more accurate as more detail is captured. Making dx equal to 700 flattens the curve as there are larger spatial intervals, thus making the details poorly captured and less Gaussian.

2) Decreasing the parameter σ makes the Gaussian curve narrower, leading to a more localised temperature disturbance at the peak. There is less material to advect, which means that this takes less time. This leads to the appearance of the fast-moving animation. Increasing the parameter σ makes the Gaussian curve wider, thus making the more spread-out mass harder to move. This leads to a longer time for advection to occur, leading to the appearance of the slow-moving animation.