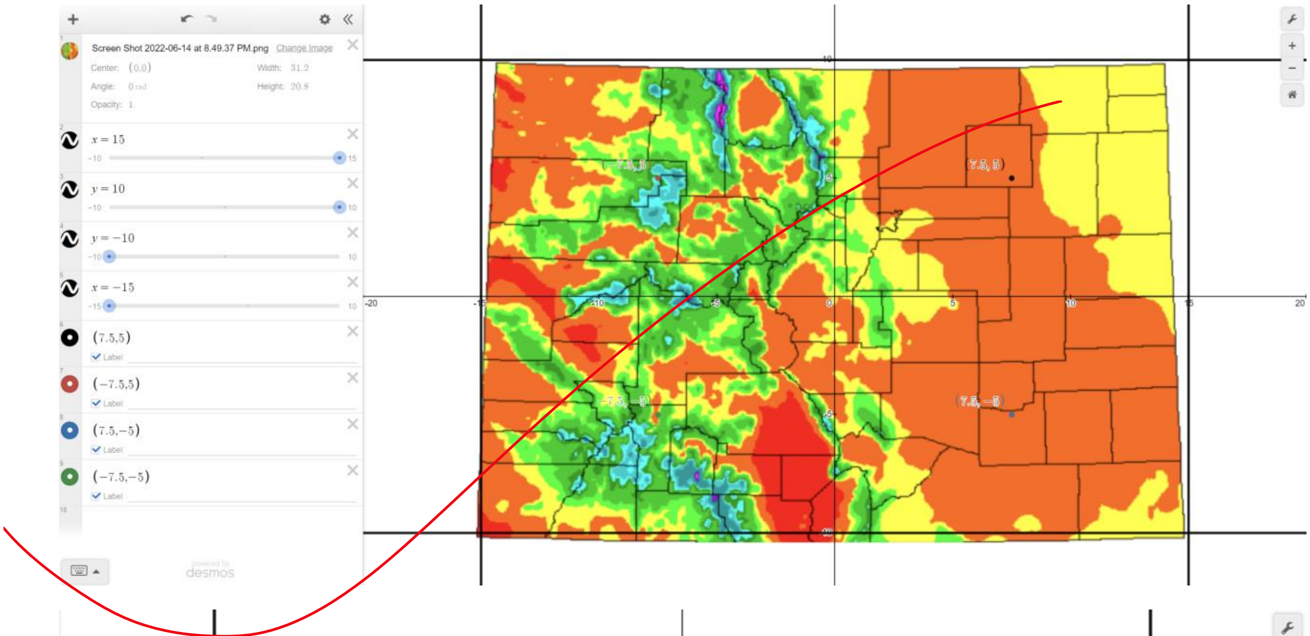
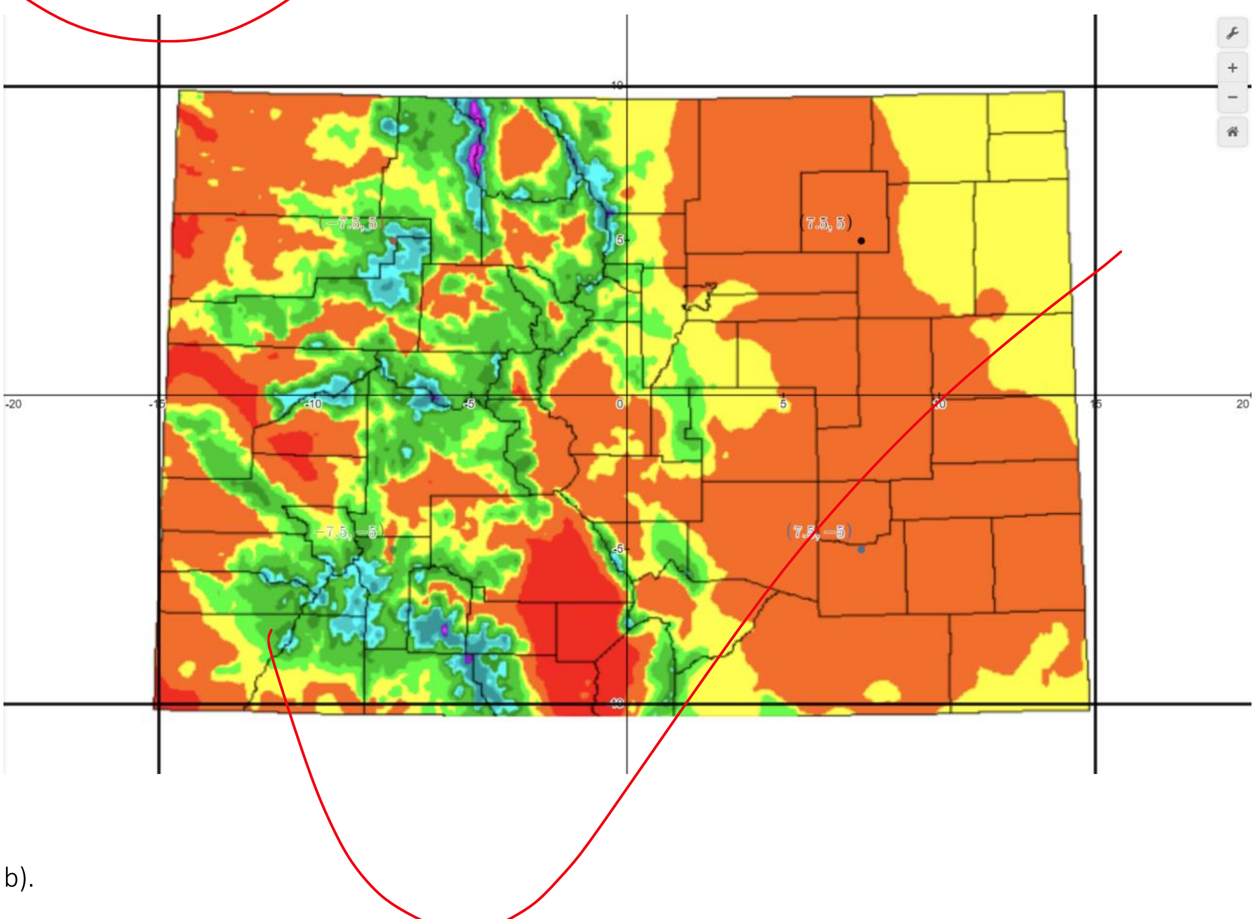
Udaya Vijay Anand – MA1024 – Lab 03

1)

a).





b).

$f(7.5\,, 5) = 12.5$ $\quad$ $f(-7.5\,, 5) = 37.5$ $\quad$ $f(7.5\,, -5) = 12.5$ $\quad$ $f(-7.5\,, -5) = 12.5$

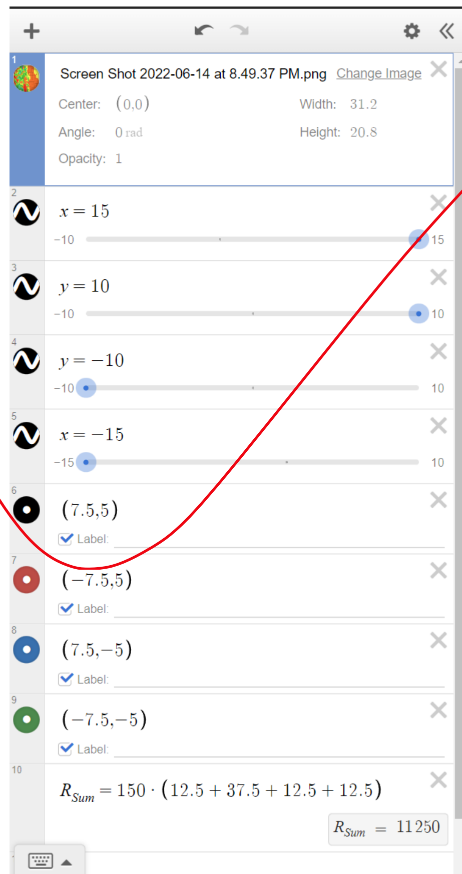
c).

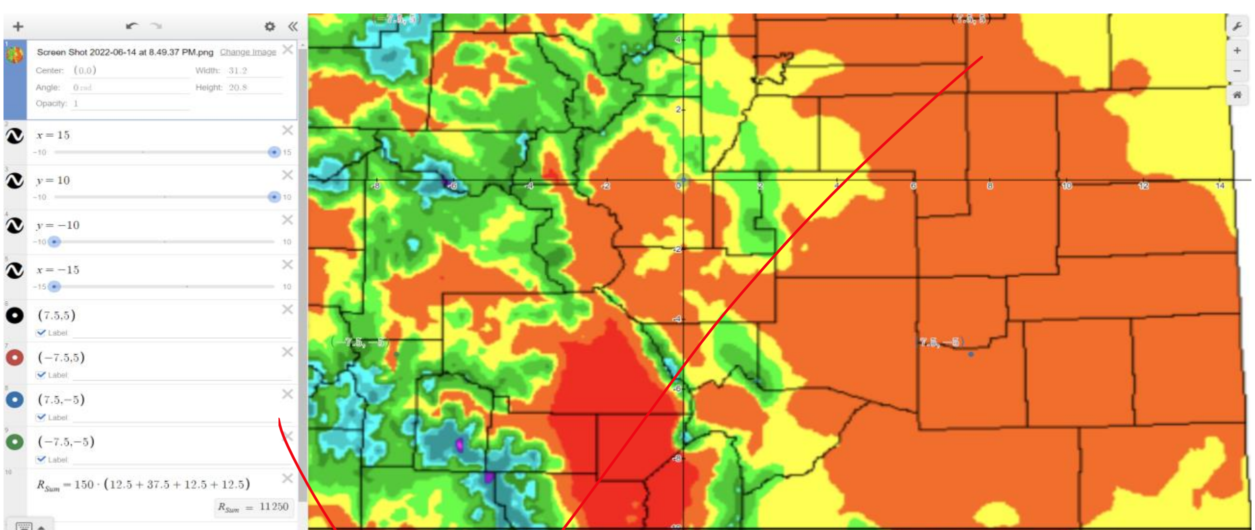
$$Riemann\ Sum = (Area\ of\ each\ rectangle) * Sum\ of\ function\ values\ at\ midpoints$$

$$Riemann\ Sum = 150 * [f(7.5\,,5) + f(-7.5\,,5) + f(7.5\,,-5) + f(-7.5\,,-5)]$$

$$Riemann\ Sum = 150 * [12.5 + 37.5 + 12.5 + 12.5]$$

$$Riemann\ Sum = 11250$$





2).

mss graph −3pt

a).

$$Calculating\ the\ midpoints\ of\ 9\ rectangles, similar\ to\ how\ I\ did\ for\ 4\ rectangles\ in\ Part\ 1.$$

$$(-10, -20/3), (-10, 0), (-10, 20/3),$$

$$(0, -20/3), (0, 0), (0, 20/3),$$

$$(10, -20/3), (10, 0), (10, 20/3)$$

b).

$$f\left(-10, -\frac{20}{3}\right) = 12.5 \qquad f(-10,0) = 37.5 \qquad f\left(-10, \frac{20}{3}\right) = 37.5$$

$$f\left(0, -\frac{20}{3}\right) = 12.5 \qquad f(0,0) = 17.5 \qquad f\left(0, \frac{20}{3}\right) = 12.5$$

$$f\left(10, -\frac{20}{3}\right) = 17.5 \qquad f\left(10, -\frac{20}{3}\right) = 12.5 \qquad f\left(10, -\frac{20}{3}\right) = 12.5$$

c).

$$Riemann\ Sum\ = \ (Area\ of\ each\ rectangle)\ *\ Sum\ of\ function\ values\ at\ midpoints$$

$$Riemann\ Sum\ = \ (200/3)\ *\ [f(-10, -20/3)\ +\ f(-10, 0)\ +\ f(-10, 20/3)\ +\ f(0, -20/3)\ +\ f(0, 0)\ +\ f(0, 20/3)\ +\ f(10, -20/3)\ +\ f(10, 0)\ +\ f(10, 20/3)]$$

$$Riemann\ Sum\ = \ (200/3)\ *\ [12.5\ +\ 37.5\ +\ 37.5\ +\ 12.5\ +\ 17.5\ +\ 12.5\ +\ 17.5\ +\ 12.5\ +\ 12.5]$$

$$Riemann\ Sum = 11500$$

3).

The choice of the number of sub-rectangles (N) for estimating average annual precipitation in Colorado is a balance between accuracy and computational complexity. The western (left) side of the state likely requires a higher N due to more varied precipitation patterns caused by mountains, while the eastern (right) side may require a lower N due to its more uniform plains.

The "best" number of sub-rectangles depends on the required level of precision, available computational resources, and time constraints. If precision is critical and computational resources are abundant, a higher N (e.g., 100 or more) could be beneficial. However, if a reasonable estimate is sufficient and resources are limited, a lower N (e.g., 20) might be more appropriate. This decision also must consider the law of diminishing returns, as extremely high values of N may not significantly improve the estimate compared to moderately high values.

−1pt

How many for left

How many for right