Raiid Ahmed Homework 3

1. The Bisect method takes the longest to converge by far, while the rest of the methods take a much shorter period. . Therefore, it seems that for this case it would make sense to use secant or false positive, because we don't need to calculate the derivative like in newton's method.

The results are as expected. Bisect is the slowest method, so the convergence rate makes sense. False positive and secant converged at similar rates, which is expected because they both used well-selected brackets. Newton converged quickly which makes sense because the initial guess ended up being very close to the root.

3. The first 4 roots follow a pattern. For the nth root, if n is odd the root seems to be close to n - .25. If n is even, the root seems to be close to n - .70. With this rule, we can approximate the 25th root to be 25 - .25. This approximation can serve as a good guess for Newton's method.

4: Finding Jacobian expressions

Function 1: $\dfrac{x^2}{186^2} - \dfrac{y^2}{300^2 - 186^2} - 1$

$$\frac{\partial 1}{\partial x} = \frac{2x}{186^2} \qquad \frac{\partial 1}{\partial y} = -\frac{2y}{300^2 - 186^2}$$

Function 2: $-\dfrac{(x-300)^2}{500^2 - 279^2} + \dfrac{(y-500)^2}{279^2} - 1$

$$\frac{\partial 2}{\partial x} = -\frac{2(x-300)}{500^2 - 279^2} \qquad \frac{\partial 2}{\partial y} = \frac{2(y-500)}{279^2}$$