

3.)

Best-case for quicksort: chooses median for the pivot, splitting the list in half, such that:

$$2T\left(\frac{n}{2}\right) + \Theta(n) = \Theta(n \log n)$$

Worst-case for quicksort: choose the last or first element in a list as the pivot, such that:

$$T(n-1) + T(1) + \Theta(n) = \Theta(n^2)$$

Runtime for our recurrence relation, choosing the 10<sup>th</sup> largest element in a list, such that:

$$T(10) + T(n-10) + \Theta(n) = \Theta(n^2)$$

Note the worst case runtime for quicksort and our recurrence relation are asymptotically equal to one another.

Ordering of the three functions from smallest to largest:

$$\Theta(n \log n) = (\text{Best-case})$$

$$(\Theta(n^2)), (\Theta(n^2)) = (\text{worst-case, our recurrence relation})$$