Quiz 1

Q5

$$\sum_{k=0}^{1000} 2k+1$$

$$= 2\sum_{k=0}^{1000} k + \sum_{k=0}^{1000} 1$$

$$= 2 \cdot \frac{1000(1000+1)}{2} + (1000-0+1)$$

$$= 1000 \cdot 1001 + 1001$$

$$= 1001000 + 1001$$

$$\boxed{= 1002001}$$

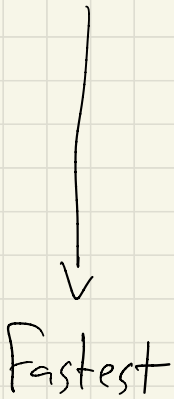
Q6

Slowest: $\log \log n$

$\log n$

$2n+5$

$n \log n$



2^n

$n!$

n^n

Quiz 2

Q1

Gamma(0) returns 1

Gamma(1) returns 1

Gamma(2) returns 2

Gamma(3) returns 6

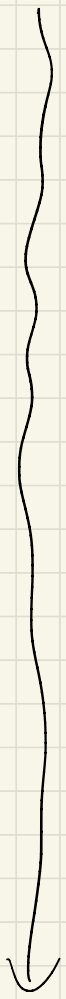
Gamma(4) returns **24**

(Gamma is a recursive implementation of Factorial, with repeated addition instead of multiplication;

$n! = n \cdot (n-1)! = \sum_{j=1}^{n} (n-1)!$)

Q2

Slowest



Fastest

$(\lg n)^{\sqrt{\lg n}}$

$2^{\lg n}$

n^2

$n^{\lg \lg n}$

$n!$

Quiz 3

Q1

Insertion sort is $T(n) = \Omega(n)$ and $O(n^2)$ so

$T(n) = O(n^3)$ True since $O(n^2) = O(n^3)$

$T(n) = \Omega(\sqrt{n})$ True since $\Omega(n) = \Omega(\sqrt{n})$

$T(n)$ not $\Theta(n \lg n)$ since worst case
False running time is $\Theta(n^2)$

$T(n) = o(n^{2.000001})$ True

since $O(n^2) = o(n^{2.000001})$

$T(n) = \omega(1)$ since $\Omega(n) = \omega(1)$

Q2 Merge-Sort is $\Theta(n \lg n)$ regardless of input so

$T(n) = O(n!)$ True since $\Theta(n \lg n) = O(n!)$

$T(n) = \Theta(n \log_{10} n)$ True since $\Theta(n \lg n) = \Theta(n \log_{10} n)$

$T(n)$ not $\Omega(n^2)$ since $\Theta(n \lg n) \neq \Omega(n^2)$

False

$T(n) = o(n \lg n \lg\lg n)$ True since $\Theta(n \lg n) = o(n \lg n \lg\lg n)$

$T(n)$ not $\omega(n \lg n)$ since $\Theta(n \lg n) \neq \omega(n \lg n)$

False