

Question 1

- a. $O(n)$
- b. $O(n^2)$
- c. $O(n^3)$
- d. $O(n^2)$
- e. $O(n^3)$
- f. $O(n)$
- g. $O(n^2 \log(n))$
- h. $O(n^2)$
- i. $O(n^3)$

Question 2

- a. $O(n)$
- b. $O(n^2)$
- c. $O(n)$
- d. $O(n^3)$
- e. $O(n)$
- f. $O(n^2)$
- g. $O(n^3)$
- h. $O(\log(n))$
- i. $O(\log(n))$
- j. $O(\log(n))$

Question 3

- a. 0.2 sec
- b. 0.8 sec
- c. 12.8 sec

Question 4: $O(n^2)$

Question 5:

$$3n^2 + 2n \log(n) + 6n + 19 = O(n^2)$$

$T(n) \leq c \cdot g(n)$ from Big-Oh Definition we state that $3n^2 \leq c \cdot n^2$ where $c > 3$

Question 6: Actual Times

Big-oh	Cubic	Quadratic	Linear-time
128	0.000923	3.2e-05	1e-06
256	0.007762	0.000124	2e-06
512	0.057348	0.000487	3e-06
1024	0.44713	0.00192	5e-06
2048	3.53053	0.007514	1e-05
4096	28.2236	0.029783	1.8e-05

Question 7: Predicted Times

Big-oh	Cubic	Quadratic	Linear-time
128	0.000923	3.2e-05	1e-06
256	007384	0.000128	2e-06
512	0.059072	0.000512	4e-06
1024	0.472576	0.002048	8e-06
2048	3.780608	0.008192	1.6e-05
4096	30.244864	0.032768	3.2e-05

Question 8:

Use formula $r^k * t_0 = t_1$ where $r^k = \left(\frac{n_1}{n_0}\right)^k$

Cubic: $(2^{11})^3 * 0.000923 = 7.9285 * 10^6$

Quadratic : $(2^{11})^2 * 3.2 * 10^{-5} = 1.342177 * 10^2$

Linear: $(2^{11}) * 10^{-6} = 2.048 * 10^{-3}$

Question 9:

Cubic: 91days 18hours 21minutes 49seconds

Quadratic: 2mins 23sec

Linear: 0.002408sec

Question 10:

n	a	b	c	d
256	1e-06	0.000122	6.2e-05	0.030999
512	1e-06	0.000469	0.000236	0.23984
1024	2e-06	0.003808	0.001499	1.96621
2048	3e-06	0.007801	0.004155	15.7101
4096	9e-06	0.033601	0.016424	123.865