CSC 565 - Computer System Architecture: Homework #X

Due on Due Date

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Problem 1

Homework Description

Solution

Part One

$$\begin{aligned} n^2 + n + 1 = & \\ & \leq n^2 + n^2 + n^2 \\ & = 3n^2 \\ & \leq c \cdot 2n^3 \end{aligned}$$

Thus a valid c could be when $c = 2$.

Part Two

Solve P2

Problem 2

Automata Example

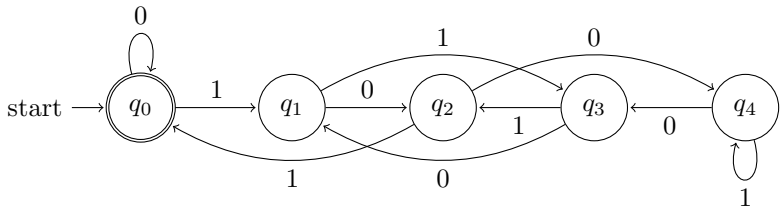

Figure 1: DFA, A, this is really beautiful, ya know?

Justification
Justify, Example Table

	$x \mod 5 = 0$	$x \mod 5 = 1$	$x \mod 5 = 2$	$x \mod 5 = 3$	$x \mod 5 = 4$
$x0$	0	2	4	1	3
$x1$	1	3	0	2	4

Problem 3

Example Algorithm Write part of **Quick-Sort(**$list, start, end$**)**

```
1: function QUICK-SORT(list, start, end)
2:     if start ≥ end then
3:         return
4:     end if
5:     mid ← PARTITION(list, start, end)
6:     QUICK-SORT(list, start, mid − 1)
7:     QUICK-SORT(list, mid + 1, end)
8: end function
```

Algorithm 1: Start of QuickSort

Problem 4

Part A
Solution

For the bias, we need to calculate the expected value $\mathrm{E}[\hat{\beta}_1]$:

$$\begin{aligned}
\mathrm{E}[\hat{\beta}_1] &= \mathrm{E}\left[\frac{\sum x_i Y_i}{\sum x_i^2}\right] \\
&= \frac{\sum x_i \mathrm{E}[Y_i]}{\sum x_i^2} \\
&= \frac{\sum x_i (\beta_1 x_i)}{\sum x_i^2} \\
&= \frac{\sum x_i^2 \beta_1}{\sum x_i^2} \\
&= \beta_1 \frac{\sum x_i^2 \beta_1}{\sum x_i^2} \\
&= \beta_1
\end{aligned}$$

Problem 18

Evaluate $\sum_{k=1}^{5} k^2$ and $\sum_{k=1}^{5} (k-1)^2$.

Problem 19

Find the derivative of $f(x) = x^4 + 3x^2 - 2$

Problem 6

Evaluate the integrals $\int_0^1 (1-x^2)\mathrm{d}x$ and $\int_1^\infty \frac{1}{x^2}\mathrm{d}x$.