

# Exam 3 Study Sheet

1. Given the following statements and post conditions, find the weakest precondition.

|  |  |
|--|--|
| <pre> if (a &lt;= 0) {     a = 0;     b = 0; } else {     b = a*a; } c = b+1;                 </pre> | <pre> if (a=b[i]) {     x=i; } else {     x=-1; }                 </pre>                                     |
| $\{a = \sqrt{c-1}\}$   | $(\exists j : 0 \leq j \leq n : a = b[j]) \Rightarrow (\exists j : 0 \leq j \leq n : a = b[j] \wedge x = j)$ |

|  |   |   |
|--|---|---|
| <pre> if (x&lt;0) {     a = -x; } else {     a = x; }                 </pre> | <pre> if (a&lt;b) {     x=a; } else {     x=b; }                 </pre> | <pre> if (i=0) {     b[i]=1; } else {     b[i]=b[i-1]+1; }                 </pre> |
| $\{a =  x \}$  | $\{x = \min(a, b)\}$  | $(\forall i : 0 \leq i < n : b[i] < b[i+1])$                                      |

2. Prove or disprove:  $1 > x > 7$  is the negation of  $1 \leq x \leq 7$ .

3. Find loop invariants for the following loops.

|   |   |   |  |
|---|---|---|--|
| <pre> total=0; i=0; while (i&lt;n) {     total += A[i];     i++; }                 </pre> | <pre> i=1; while (i&lt;n) {     A[i] += A[i-1];     i++; }                 </pre> | <pre> i=0; while (i&lt;n) {     C[i] = A[i]+B[i];     i++; }                 </pre> | <pre> i=0; total=0; while (i&lt;n) {     total += i;     i++; }                 </pre> |
|---|---|---|--|

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4. Prove the following function correct.

```
long AsciiToBinary(char * InVal)
{
    long rv = 0;
    char * tc = InVal;
    while (*tc != '\0')
    {
        char tc2 = *tc - '0';
        rv = rv * 10;
        rv = rv + tc2;
    }
}
```

5. Prove the following function correct.

```
Long FindX(char x, char *String)
{
    for (i=0 ; i<strlen(String) ; i++)
    {
        if (String[i] == x)
        {
            return i;
        }
    }
    return -1;
}
```