Program1

(a) Explain what is wrong with the given code. Describe the fault precisely by proposing a modification to the code.

The program didn't correctly traverse the array. The starting index of the array is 0, not 1.

To modify the code, we can simply change the code from

` for (let i = x.length - 1; i > 0; i--)`

To

` for (let i = x.length - 1; i >= 0; i--)`

After that, the code should run correctly.

(b) If possible, give a test case that does not execute the fault. If not, briefly explain why not. (You need to give the same number of arguments.)

Test case: x = [2, 3, 5]; y = 'c'

Expected output & actual output : "TypeError: The second parameter must be a number"

(c) If possible, give a test case that executes the fault, but does not result in an error state. If not, briefly explain why not. (You also need to answer expected and actual output.)

Test case: x=[2, 3, 5]; y = 3

Expected output: 1, actual output: 1

(d) If possible, give a test case that results in an error state, but not a failure. If not, briefly explain why not. (You also need to answer expected and actual output.)

Test case: x = [2, 3, 5]; y = 4;

Expected output = -1, actual output = -1

(e) For the given test case in (d), describe the first error state. Be sure to describe the complete state.

The first error state:

PC points to statement: return -1;

i = 0;

Program2

(a) Explain what is wrong with the given code. Describe the fault precisely by proposing a modification to the code.

The statement ` return i; ` makes the program returns first index of zero instead of the last ones.

To modify the code, it should be change to:

```
` function lastZero(x) {
    if (!Array.isArray(x)) {throw new TypeError('Not an array');}
    let index = -1;
    for (let i = 0; i < x.length; i++) {
        if (x[i] === 0) {index = i;}
}
 return index;
} `
```

Using another variable to store the index of zeros and it should work correctly.

(b) If possible, give a test case that does not execute the fault. If not, briefly explain why not. (You need to give the same number of arguments.)

Test case: x = ‘c’

Expected output & actual output : “TypeError: Not an array”

(c) If possible, give a test case that executes the fault, but does not result in an error state. If not, briefly explain why not. (You also need to answer expected and actual output.)

It is not possible to find such a test case, because whenever the fault is executed (return i), it results in an error state at the same time.

(d) If possible, give a test case that results in an error state, but not a failure. If not, briefly explain why not. (You also need to answer expected and actual output.)

Test case: x = [0, 1, 2];

Expected output: 0, actual output: 0

(e) For the given test case in (d), describe the first error state. Be sure to describe the complete state.

PC points to `return i;`

Value of variable i depends on 0 index in the array.

Program3

(a) Explain what is wrong with the given code. Describe the fault precisely by proposing a modification to the code.

The if-statement is wrong.

It should be modify from `if (x[i] >= 0)` to `if (x[i] > 0)` , so that the program doesn’t count zero-value element in the array.

(b) If possible, give a test case that does not execute the fault. If not, briefly explain why not. (You need to give the same number of arguments.)

Test case: x = ‘c’

Expected output & actual output : “TypeError: Not an array”

(c) If possible, give a test case that executes the fault, but does not result in an error state. If not, briefly explain why not. (You also need to answer expected and actual output.)

Test case: x = [1, 1, 1]

Expected output = 3, actual output = 3

(d) If possible, give a test case that results in an error state, but not a failure. If not, briefly explain why not. (You also need to answer expected and actual output.)

It is not possible to find such a test case. Because in this program, the only scenario that causes an error state is the variable 'count' has incorrect value. And the incorrect value of variable 'count' always results in a failure.

(e) For the given test case in (d), describe the first error state. Be sure to describe the complete state.

It is impossible to give a test case.

Program4

(a) Explain what is wrong with the given code. Describe the fault precisely by proposing a modification to the code.

To modify the code, it should be changed from ` if (x[i] % 2 === 1 || x[i] > 0)` to ` if (x[i] % 2 === -1 || x[i] % 2 === 1 || x[i] > 0)`

(b) If possible, give a test case that does not execute the fault. If not, briefly explain why not. (You need to give the same number of arguments.)

Test case: x = ‘c’;

Expected output &Actual output: “TypeError: Not an array”

(c) If possible, give a test case that executes the fault, but does not result in an error state. If not, briefly explain why not. (You also need to answer expected and actual output.)

Test case: x = [1, 2, 3, 4, 5];

Expected output = 5, actual output = 5

(d) If possible, give a test case that results in an error state, but not a failure. If not, briefly explain why not. (You also need to answer expected and actual output.)

It is not possible to find such a test case. Because in this program, the only scenario that causes an error state is the variable ‘count’ has incorrect value. And the incorrect value of variable ‘count’ results in a failure.

(e) For the given test case in (d), describe the first error state. Be sure to describe the complete state.

It is impossible to give a test case.