Recurrence Relations Reading Worksheet

Name:—————————————————

1. What does it mean to *solve* a recurrence relation?

2. What proof technique do you use when solving a recurrence relation using the *substitution method*?

3. The *iteration method* is probably not a good choice to solve the following recurrence relation. Explain why.

$$T(n) = T(n-1) + 3T(n-2) + n * T(n/3) + n^2, \ \ T(1) = 17$$

4. For each of the following, circle True or False. Justify your answer, addressing the key fact(s) or fallacy(s).

T   F   The Master Method can be used to solve the recurrence relation $S(n) = 3S(n-4) + n, \ S(1) = 12$

T   F $T(n) = 4T(n/3) + n$ is a linear recurrence relation.

T   F   The Master Method can be used to find an exact solution to a recurrence relation.

5. In computer science, trade-offs are common. In other words, when you make choices you often sacrifice one thing for another. What is the trade-off of the fact that the Master Method is so easy to use?

6. Give a recurrence relation for the number of times each of the following algorithms calls `print`. You do *not* need to solve it.

(a)
```
void OneToN(int n) {
    if(n>1) {
        OneToN(n-1);
    }
    print(n);
}
```

(b)
```
void Ternary(int n) {
    print(n%3);
    Ternary(n/3);
}
```

7. Solve the following recurrence relations. Clearly state which technique you use in each case.

(a) $T(n) = 4T(n/2) + 5$, $T(1) = 1$.

(b) $a_n = a_{n-1} + 2$, $a_1 = 2$.