Quiz Questions: Induction and Reduction

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1. Which expression does fast recursive exponentiation evaluate when computing a^6?
   A. (((((a*1)*a)*a)*a)*a)*a
   B. $a^1 * (a^0 * (a^3)^2)$
   C. $a^0 * (a^1 * (a^2))^2$
   D. $a^0 * (a^1 * (a^2)^2)$

2. Which of the following formulae is not well-formed?
   A. $(F \leftrightarrow F)$
   B. $(T \leftrightarrow T)$
   C. $(T \rightarrow F)$
   D. $F \rightarrow T$

3. Suppose f(n) has the recursive definition $(n) = \frac{3}{f(n-1)} - n$ and $f(1) = \frac{1}{2}$. What is $f(2)$?
   A. 4
   B. $-\frac{1}{2}$
   C. -6
   D. 2

4. Let $P(n) = (n!)^2 > n^n$, where $n > 2$. What is the statement $P(n+1)$?
   A. $(n!)^2 > (n+1)^{n+1}$
   B. $n!\ (n+1)! > n^{n+1}$
   C. $(n+1)!\ n! > (n+1)^n$
   D. $((n+1)^2)! > (n+1)^{n+1}$

5. Let $3 \in S$ and if x, y in S then $x * y - 1 \in S$
   A. $S = \{2, 3, 5, 8, 9, \ldots\}$
   B. $S = \{3, 9, 27, 81, 243, \ldots\}$
   C. $S = \{1, 2, 3, 4, \ldots\}$
   D. $S = \{3, 8, 23, 63, 68, \ldots\}$

6. You want to prove by mathematical induction $1 + 2 + 2^2 + \cdots + 2^n = 2^{n+1} - 1$ for $n > 1$. The correct statement in the basis step is:
   A. $1 + 2^1 = 2^{1+1} - 1$
   B. $1 + 2 + 2^2 + \cdots + 2^{n-1}$
   C. $1 + 2^1 + 2^2 = 2^{2+1} - 1$
   D. $1 + 2 + 2^2 + \cdots + 2^n = 2^{n+1} - 1$

7. Which of the following functions is not defined recursively?
   A. $f(n+1) = (n+2) * f(n-1) + 1$
   B. $f(n) = \frac{n+1}{f(n-1)}$
   C. $f(n) = (n+1) * f(n) + (n+1)$
   D. $f(n+1) = (n-1) * f(n) - 1$

8. A Lucas sequence is defined as $f(0) = 0,\ f(1) = 1, f(n) = f(n-1) + 2f(n-2)$. What is $f(4)$?
    A. 2
    B. 3
    C. 4
    D. 5

Answers:

1. C
2. D
3. A
4. C
5. D
6. C
7. C
8. D