Name: ______________________________

1. (1 pt.)
   - **Read all material carefully.**
   - This test is **closed book, closed notes**.
   - However, you may refer to **one** standard Letter-sized sheet of paper (both sides) that has **notes hand-written by you**. If used, this sheet of notes must **include your name** near the top and must be **submitted** along with the test.
   - Computing or communication devices of any kind (laptop computers, tablets, phones, calculators, etc.) are not permitted.
   - Network access of any kind (cell, voice, text, data, etc.) is not permitted.
   - Write, and draw, carefully. Ambiguous or cryptic answers receive zero credit.
   - Use class and textbook conventions for notation, algorithmic options, etc.

Print your name clearly in the space provided above.
Do not write anything else on this page.

WAIT UNTIL INSTRUCTED TO CONTINUE TO REMAINING QUESTIONS.

(Do not view any other pages.)

Do not write on this page.
(It is for use in grading only.)

Q	Full	Score
1	1	
2	9	
3	10	
4	10	
5	20	
total	50	

2. (9 pts.) Derive an **exact closed-form expression** (not merely asymptotic bounds such as Θ or O) for the algorithmic recurrence f_1 defined below. Present all important intermediate steps.

$$f_1(n) = 1 + \sum_{i=0}^{n-1} f_1(i)$$

3. (10 pts.) Solve the following algorithmic recurrence to yield as tight asymptotic bounds as possible. *Clearly state the method used and present its important steps.*

$$f_2(n) = 5f_2(n/3) + 6n^2 - 4.54$$

4. (10 pts.) Prove or disprove: If $f(n) = \Theta(g(n))$ and $g(n) = \Theta(f(n))$ then there exist constants c, d such that $f(n) = c \cdot g(n) + d$.

5. (20 pts.) Trace the execution of the textbook's Extended-Bottom-Up-Cut-Rod(p, n) algorithm for $n = 10$ and the following pricing array p:

i :	1	2	3	4	5	6	7	8	9	10
p[i] :	3	2	7	10	10	15	20	18	25	24

Depict the state of the arrays r **and** s (as used by that algorithm) at the termination of the algorithm. *Depict intermediate steps* to better qualify for partial credit.

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