Quiz 1 Solutions

1. True or False.
   a. True
   b. False
   c. False
   d. True
   e. True
   f. True

2. Limit Rule.

$$\lim_{n\to\infty} \frac{100n^2 + 5n - \log_2 n}{n^2} = \lim_{n\to\infty} 100 + \frac{5}{n} + \frac{\log_2 n}{n^2} = 100 + 0 + 0 = 100 \in R^+$$

3. Analyze the cost of following algorithm.
   a. $T(n) = 16T\left(\frac{n}{4}\right) + n^2$
   b. $a = 16,\ b = 4,\ f(n) = n^2,\ n^{\log_b a} = n^{\log_4 16} = n^2,\ case\ 2,\ T(n) = \Theta(n^2 \log n)$

4. Solve the following recurrence.
   a. $a = 3,\ b = 2,\ f(n) = n^{0.5},\ n^{\log_b a} = n^{\log_2 3} = n^{1.58},\ case\ 1,\ T(n) = \Theta(n^{\log_2 3})$
   b. $a = 7,\ b = 2,\ f(n) = n^3,\ n^{\log_b a} = n^{\log_2 7} = n^{2.80},\ case\ 3,\ T(n) = \Theta(n^3)$