Problem type 1:

Provide the upper-asymptotic bound (O-notation) of the following recurrence:

(See variants below)

a. **BYB**

$T(n) = 2T(n-1) + 1$ and $T(1) = 1$

Solution: $O(2^n)$ ■

b. **BYE**

$T(n) = T\left(\frac{n}{2}\right) + 1$ and $T(1) = 1$

Solution: $O(\log(n))$ ■

c. **BYA**

$T(n) = n \cdot T(n-1) + 1$ and $T(1) = 1$

Solution: $O(n!)$ ■

d. **BYF**

$T(n) = T(n-1) + n$ and $T(1) = 1$

Solution: $O\left(n^2\right)$ ■

e. **BYH**

$T(n) = 2T\left(\frac{n}{4}\right) + \sqrt{n}$ and $T(1) = 1$

Solution: $O\left(\sqrt{n}\log(n)\right)$ ■

f. **BYD**

$T(n) = T\left(\frac{n}{4}\right) + \sqrt{n}$ and $T(1) = 1$

Solution: $O\left(\sqrt{n}\right)$ ■

g. **BYC**

$T(n) = 4T\left(\frac{n}{2}\right) + n^2$ and $T(1) = 1$

Solution: $O\left(n^2\log(n)\right)$ ■

h. **BYG**

$T(n) = 2T\left(\frac{n}{2}\right) + n^2$ and $T(1) = 1$

Solution: $O\left(n^2\right)$ ■