PS. 30

Noah

Oops, numbers didn't work out well on #2.
The temperature should have been 155°F.

#2

Concept: Mercury and glass expand as they are heated. The mercury expands more, so some overflows.

\[ \Delta V_{Hg} = \beta V_0 \Delta T \]

\[ T_i = 0 ^\circ C \quad T_f = 155 ^\circ F = 68 ^\circ C \]

\[ \Delta V_{Hg} = (18 \times 10^{-5})(1000 \text{ cm}^3)(68 ^\circ C) \]

\[ = 12.24 \text{ cm}^3 \]

So Mercury expanded 12.24 cm³, but only 8.95 cm³ overflowed, so the glass must have expanded

\[ 12.24 - 8.95 = 3.29 \text{ cm}^3 \]

Putting this into \[ \Delta V_{glass} = V_0 \beta_{glass} \Delta T \]

we see \[ \beta_{glass} = \frac{\Delta V_{glass}}{V_0 \Delta T} \]

\[ \beta_{glass} = \frac{3.29}{1000 \cdot 68} = \boxed{4.84 \times 10^{-5} \text{ k}^{-1}} \]

This is the coefficient of volume expansion.