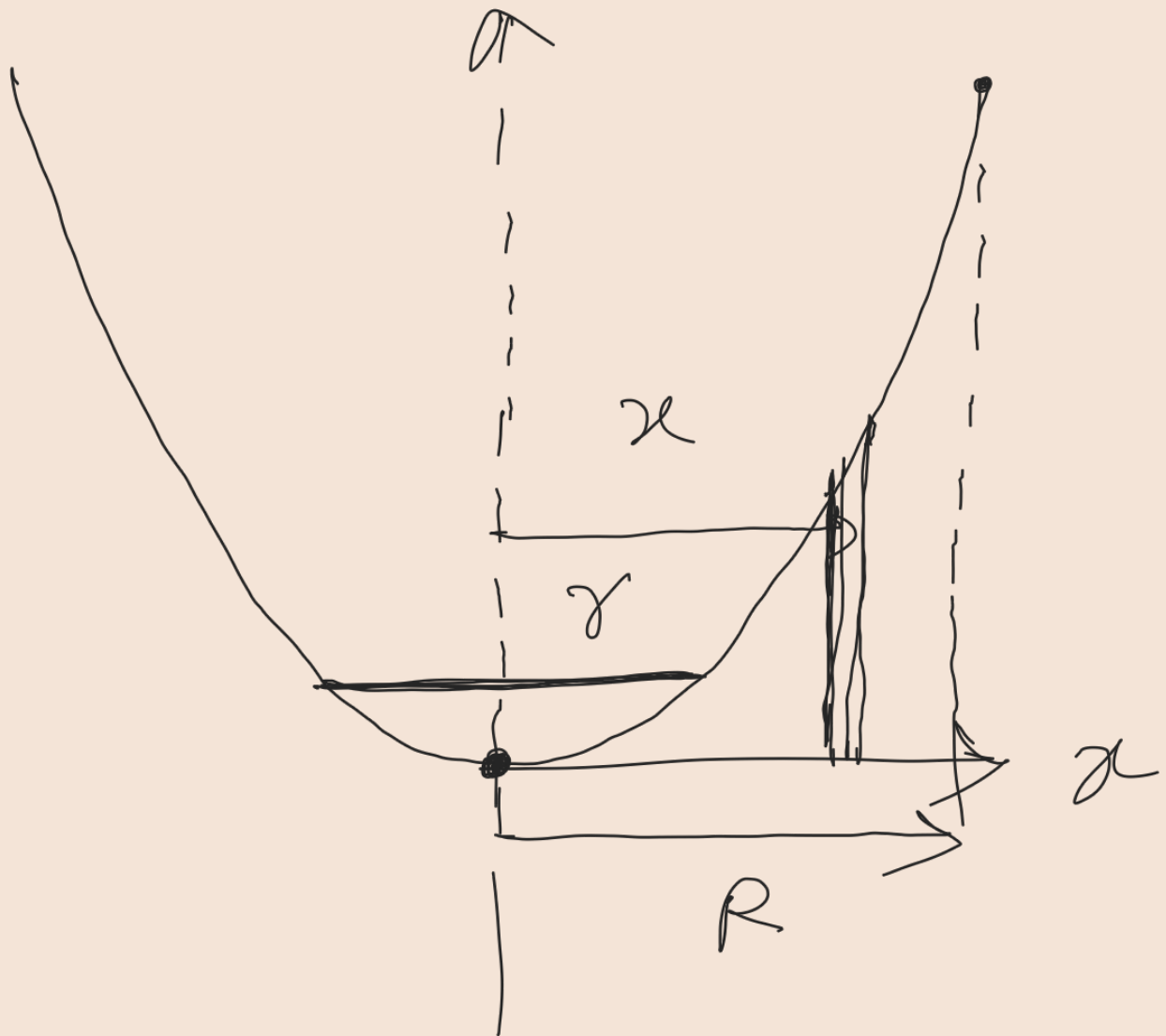


Let's consider the liquid profile when it stops leaking from bottom orifice.

$$y = \frac{\omega^2 x^2}{2g}$$



Volume of liquid remaining

$$\text{will be } \int_r^R \left(\frac{\omega^2 x^2}{2g} \right) (2\pi x) dx$$

$$= \frac{\pi \omega^2 (R^4 - r^4)}{4g} \quad \text{Note}$$

that this is not exact
volume as the height of
strip taken is not
'y' but 'y - something'.

Since orifice is small,
we can neglect, but

Actual volume of
remaining water will be

less than calculated
volume. Water flow
will be

$$\pi R^2 h - \frac{\pi \omega^2}{4g} [R^4 - r^4]$$

Actual volume of
flow water will be
slightly 'more' than
this calculated value.
Hence answer uses
approximate sign.