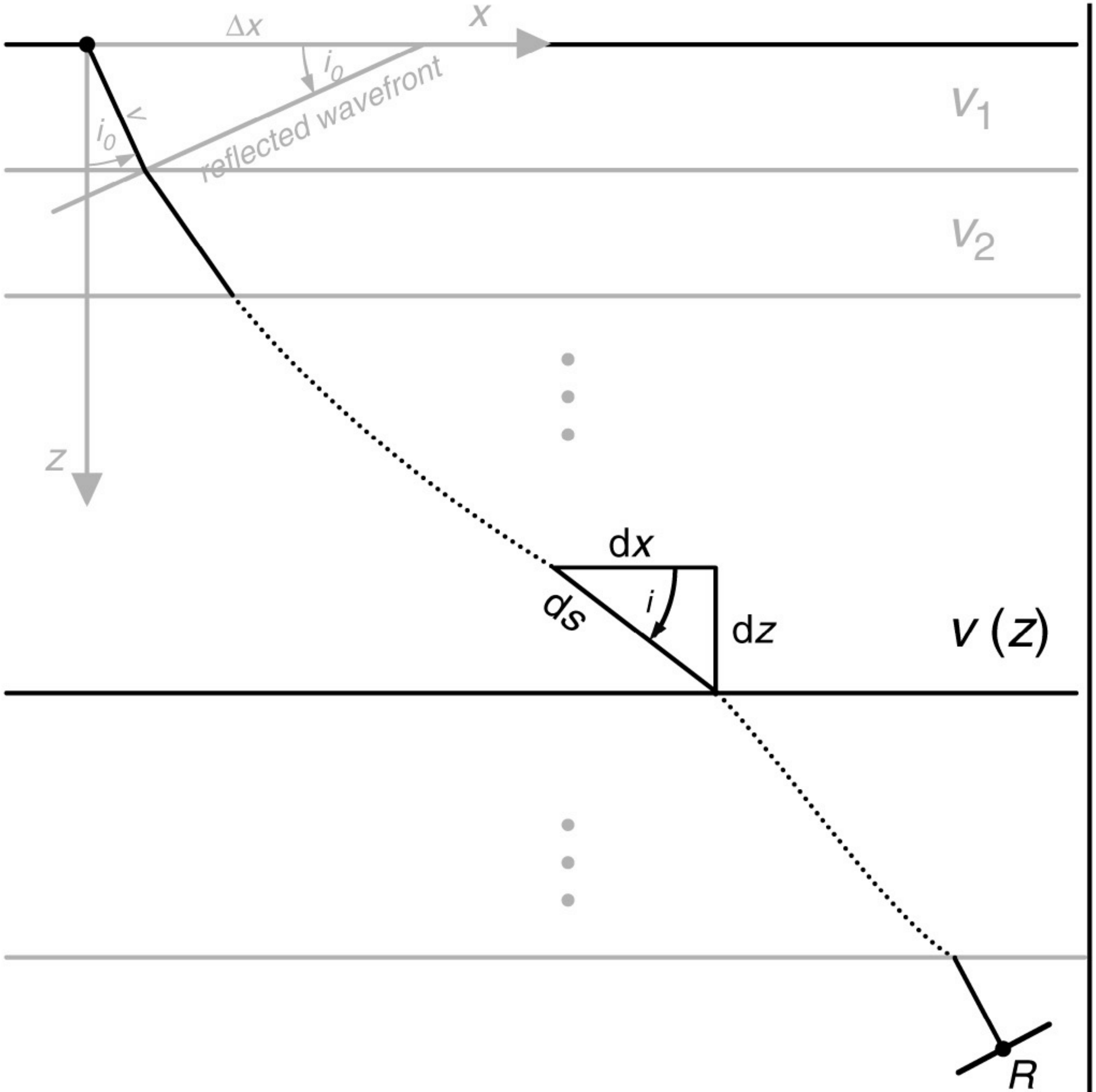

Snell's law: $\dfrac{\sin i(z)}{v(z)} = -\dfrac{\Delta t}{\Delta x} = p$

$\sin i = -\dfrac{\Delta t}{\Delta x}\, v(z)$

$\tau_0 = \dfrac{2z}{v}$ *(travel time along a vertical ray)*

$v(z) \Rightarrow v(\tau)$ $\qquad$ $d\tau = dt \cos i$

$dz = v(\tau)\, d\tau$

$ds = dz/\cos i = v(\tau)\, d\tau/\cos i$

$dx = ds \sin i = v(\tau) d\tau/\cos i \;\; (-v(\tau))\dfrac{\Delta t}{\Delta x}$

Approximations:

upper limit of integral $t_0/2$ instead of $\tau_0/2$

$1/\cos i \approx 1$

$$x = -\frac{\Delta t}{\Delta x}\int^{\tau_0/2}\frac{1}{\cos i}\, v^2(\tau)\, d\tau + \frac{x_{24}+x_1}{4}$$

$$\approx -\frac{\Delta t}{\Delta x}\int^{t_0/2} v^2(\tau)\, d\tau + \frac{x_{24}+x_1}{4} \qquad \int^{t_0/2} v^2(\tau)\, d\tau = \overline{v^2}\, t_0/2$$

Equation (2)