$y = 150 - \frac{1}{40}(x - 50)^2 \quad \Rightarrow \quad y' = -\frac{1}{20}(x - 50) \quad \Rightarrow \quad 1 + (y')^2$

$= 1 + \frac{1}{20^2}(x - 50)^2$, so the distance traveled by the kite is

$L = \int_0^{100} \sqrt{1 + \frac{1}{20^2}(x - 50)^2}\, dx = \int_{-5/2}^{5/2} \sqrt{1 + u^2}\,(20\,du) \qquad \begin{bmatrix} u = \frac{1}{20}(x - 50), \\ du = \frac{1}{20}\,dx \end{bmatrix}$

$= 20\left[\frac{1}{2}u\sqrt{1 + u^2} + \frac{1}{2}\ln\left(u + \sqrt{1 + u^2}\right)\right]_{-5/2}^{5/2}$

$= 10\left[\frac{5}{2}\sqrt{\frac{29}{4}} + \ln\left(\frac{5}{2} + \sqrt{\frac{29}{4}}\right) + \frac{5}{2}\sqrt{\frac{29}{4}} - \ln\left(-\frac{5}{2} + \sqrt{\frac{29}{4}}\right)\right]$

$= \frac{25}{2}\sqrt{29} + \frac{25}{2}\sqrt{29} + 10\ln\left(\frac{5 + \sqrt{29}}{-5 + \sqrt{29}}\right) \approx 167.6$ ft