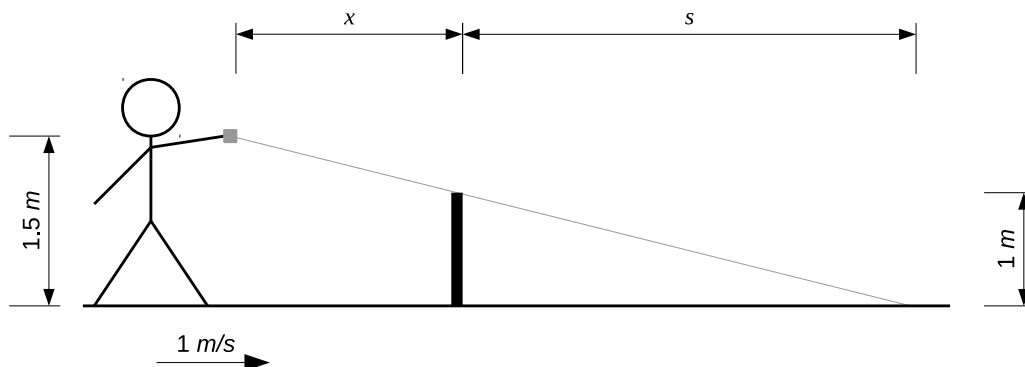


Mathematics 1110H – Calculus I: Limits, Derivatives, and Integrals

TRENT UNIVERSITY, Summer 2026 (S62) [reading course]

Solutions to Quiz #5

Due just before midnight on Friday, 10 July.



1. Stickon Stick, carrying a lamp 1.5 m above the ground, walks at 1 m/s along level ground directly toward a 1 m tall post at night. How is the length of the shadow cast by the post in the lamplight changing at the instant that the lamp is 2 m from the post?

SOLUTION. Let x be the horizontal distance between the lamp and the post, and let s be the length of the shadow, as in the slightly modified diagram above. We are given that $\frac{dx}{dt} = -1$. By the similarity of the triangles involved, $\frac{x+s}{1.5} = \frac{s}{1}$, so $x+s = 1.5s = \frac{3}{2}s$ and so $x = \frac{1}{2}s$ and $s = 2x$. It follows that $\left. \frac{ds}{dt} \right|_{x=2} = 2 \left. \frac{dx}{dt} \right|_{x=2} = 2(-1) = -2$ m/s. Thus the length of the shadow is decreasing at a rate of 2 m/s at the instant in question. Note that it changes at the same constant rate at every other instant, too. ■