3. As you sit on a shore, you notice a duck swimming towards its nest. At that moment, the duck is 7 m away from its nest and swimming with a speed of 2 m/s, and the distance between you and the duck is 8 m and increasing at a rate of 1 m/s. Determine how far you are from the duck's nest.

Let the lengths a, b, c, and the angle A be as shown in the figure.

By the Law of Cosines:

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\Downarrow \; d/dt$$

$$a\frac{da}{dt} = b\frac{db}{dt} - \frac{db}{dt}c\cos A$$

$a = 8\,m,\ \frac{da}{dt} = 1\,m/s,\ b = 7\,m,\ \frac{db}{dt} = -2\,m/s$

$$8^2 = 7^2 + c^2 - 2\cdot 7\cdot c\cos A$$

$$8.1 = 7\cdot(-2) - (-2)\cdot c\cos A \Rightarrow c\cos A = 11$$

$$c^2 = 169$$

$$\Downarrow$$

$$c = 13\,m$$

$\Rightarrow$ You are 13 m away from the duck's nest.