Mini-math Div 3/4: Monday, November 2, 2020 (10 minutes)

(1) A kite is flying horizontally with a speed of 15 km/h at an altitude of 30 m above a person. Find the rate at which the string is spooling out when the kite is 200 m horizontally away from the person, in m/s (you do *not* need to simplify).

Solution: Let x be the horizontal distance from the person to the kite and D be the distance from the person to the kite. Then

$$D^2 = x^2 + 30^2$$

Differentiating,

$$2D\frac{dD}{dt} = 2x\frac{dx}{dt}$$
$$\frac{dD}{dt} = \frac{x}{D}\frac{dx}{dt}$$

200 m horizontally away from the person, the kite is $D = \sqrt{200^2 + 30^2}(\approx 202.237)$ km, so

$$\frac{dD}{dt} = \frac{200}{\sqrt{200^2 + 30^2}} \cdot \frac{15000}{3600}(\approx 4.121)\,\text{m/s}$$

The string is spooling out from the person at 4.121 m/s.