3. (20 pts.) A string that is under 50 N of tension has linear density 0.005 kg/m. A sinusoidal wave with amplitude 0.03 m and wavelength 2.0 m travels along the string. What is the maximum *transverse* speed of a particle on the string?

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$$y(x,t) = A\sin(kx - \omega t)$$

$$u_y = \frac{\partial y}{\partial t} = -\omega A\cos(kx - \omega t)$$

$$u_{y,max} = \omega A = 2\pi f A = 2\pi\left(\frac{v}{\lambda}\right)A$$

$$u_{y,max} = 2\pi\left(\frac{\sqrt{F_T/\mu}}{\lambda}\right)A = \boxed{9.42\ m/s}$$