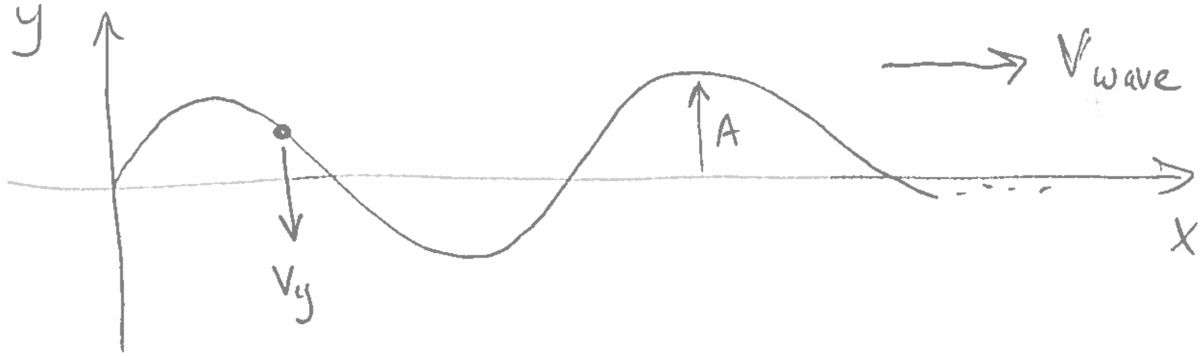

Joe stretches a string of mass $m = 2.5$ kg and length $L = 100$ m between two posts.

$$\mu = \frac{m}{L} = \frac{2.5\text{ kg}}{100\text{ m}} = 0.025\text{ kg/m}$$

He whacks one end, creating a wave with amplitude $A = 0.018$ m. The crests are $\lambda = 1.1$ m apart, and the speed of the wave along the string is $V_{wave} = 18.6$ m/s.

Use V_{wave} and k to find angular speed ω.

$$\omega = V_{wave} \cdot k = \left(18.6\,\tfrac{m}{s}\right)\left(\frac{2\pi\text{ rad}}{1.1\text{ m}}\right)$$

$$\omega = 106\,\frac{\text{rad}}{s}$$

Now, if

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

$$v_y(x,t) = \frac{dy}{dt} = \omega A \sin(kx - \omega t)$$

So the maximum vertical speed is

$$\max V_y = \omega A = \left(106\,\frac{\text{rad}}{s}\right)(0.018\text{ m})$$

$$= 1.91\,\frac{m}{s}$$

Likewise, we can find the vertical acceleration of the string by taking the second time derivative:

$$a_y = \frac{d^2y}{dt^2} = -\omega^2 A \cos(kx - \omega t)$$

The maximum value of a_y is

$$\max a_y = \omega^2 A = \left(106 \tfrac{rad}{s}\right)^2 (0.018\,m)$$

$$= 203 \tfrac{m}{s^2}$$

The power carried by this wave is

same as amplitude A

$$\text{Power} = \frac{1}{2}(\mu v_{wave})\,\omega^2 y_{max}^2$$

$$= \frac{1}{2}\left(0.025 \tfrac{kg}{m}\right)\left(18.6 \tfrac{m}{s}\right)\left(106 \tfrac{rad}{s}\right)^2 (0.018\,m)^2$$

$$= 0.85 \text{ Watts}$$