**Worksheet –** Kinematics & Dynamics solutions

The velocity of Princess Peach's 4 kg hang-glider is given by $\vec{v}=\left(4t\hat{x}+5t^{2}\hat{y}\right)\frac{m}{s}$ with the time (t) being in seconds as she elegantly soars above the Mushroom Kingdoms' go kart contestants below. (Peach herself having a negligible weight and mass due to being so fluttery in her large dress.)

At the instant the net force on her hang-glider has a magnitude of 43N, what is her acceleration?

$$\vec{a}=\frac{d\vec{v}}{dt}=\frac{d}{dt}\left(4t\hat{x}+5t^{2}\hat{y}\right)\frac{m}{s}=\left(4\hat{x}+10t\hat{y}\right)\frac{m}{s^{2}}$$

$$F=ma=m\left|\vec{a}\right|=4kg\sqrt{\left(4\right)^{2}+\left(10t\right)^{2}}N=43N$$

$$t=\sqrt{\frac{\frac{F^{2}}{m^{2}}-a\_{x}^{2}}{a\_{y}^{2}}}=0.9978s$$

$$\vec{a}=4\frac{m}{s^{2}}\hat{i}+9.98\frac{m}{s^{2}}\hat{j}$$

**(b)** Solve for the magnitude of her acceleration.

$$a=\sqrt{\left(4\frac{m}{s^{2}}\right)^{2}+\left(9.98\frac{m}{s^{2}}\right)^{2}=}10.75\frac{m}{s^{2}}$$