23. We note that The rope is 22° from vertical – and therefore 68° from horizontal.

(a) With $T = 760$ N, then its components are

$$\vec{T} = T\cos 68^\circ\,\hat{\mathrm{i}} + T\sin 68^\circ\,\hat{\mathrm{j}} = 285\,\hat{\mathrm{i}} + 705\,\hat{\mathrm{j}}$$

understood to be in newtons.

(b) No longer in contact with the cliff, the only other force on Tarzan is due to earth's gravity (his weight). Thus,

$$\vec{F}_{\mathrm{net}} = \vec{T} + \vec{W} = 285\,\hat{\mathrm{i}} + 705\,\hat{\mathrm{j}} - 820\,\hat{\mathrm{j}} = 285\,\hat{\mathrm{i}} - 115\,\hat{\mathrm{j}}$$

again understood to be in newtons.

(c) In a manner that is efficiently implemented on a vector capable calculator, we convert from rectangular (x, y) components to magnitude-angle notation:

$$\vec{F}_{\mathrm{net}} = (285, -115) \longrightarrow (307\ \angle -22^\circ)$$

so that the net force has a magnitude of 307 N.

(d) The angle (see part (c)) has been found to be 22° below horizontal (away from cliff)

(e) Since $\vec{a} = \vec{F}_{\mathrm{net}}\,/\,m$ where $m = W/g = 84$ kg, we obtain $\vec{a} = 3.67\ \mathrm{m/s}^2$

(f) Eq. 5-1 requires that $\vec{a} \parallel \vec{F}_{\mathrm{net}}$ so that it is also directed at 22° below horizontal (away from cliff).