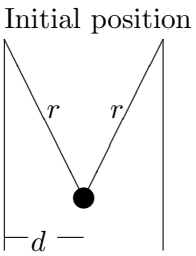
MATH 2130 – Tutorial Problems, Thu Jan 11

Cartesian components of a vector

Example. Let γ be an angle, $0 < \gamma < \pi$, and let $r > 0$ be a constant. Find the Cartesian components of all vectors that have length r, that make angle γ with the positive z-axis, and that have equal x- and y-components.

Sum of forces

Example. A mass M is suspended from two ropes, each of length r. The ropes are attached to identical vertical poles that are a distance $2d$ apart.



The mass is pulled outward by a horizontal force $\mathbf{F}$ until it has been lifted vertically by h. Find the horizontal force $\mathbf{F}$ required to hold this new position.

Component of a vector in a given direction

Example. Find all vectors $\mathbf{v}$ such that the component of $\mathbf{v}$ in the direction of $\mathbf{u} = (1, 0, 2)$ is $\sqrt{5}$, and the component of $\mathbf{v}$ in the direction of $\mathbf{w} = (-1, 1, -1)$ is $-\sqrt{3}$.