- Ch-2:26 Add magnitudes of all right-ward forces and left-ward forces separately. Difference of total right-ward force and total left-ward force is net pull on the knot. Direction is easy to figure out.

- Ch-2:36
$$\vec{R} = \vec{A} + \vec{B} \tag{1}$$
Let's find out magnitude of vector $\vec{R}$ in terms of magnitude of vector $\vec{A}$ and $\vec{B}$ and the angle between them.
$$\vec{R}.\vec{R} = (\vec{A} + \vec{B}).(\vec{A} + \vec{B}) = A^2 + B^2 + \vec{A}.\vec{B} + \vec{B}.\vec{A} \tag{2}$$
where $A = |\vec{A}|, B = |\vec{B}$ is magnitude of vectors $\vec{A}$ and$\vec{B}$. Dot product between vectors is commutative meaning $\vec{A}.\vec{B} = \vec{B}.\vec{A}$
$$R^2 = A^2 + B^2 + 2AB\cos\phi \tag{3}$$
whereϕ is the angle between the two vectors. As you can see $0 \leq \phi \leq 180$ we have maximum magnitude when $\phi = 0$ and minimum magnitude when $\phi = 180$.

- Ch-2:77 See solution to 36 for proof.

- Ch-2:88 $\phi = \arccos(\frac{R^2-A^2-B^2}{2AB})$. If $|\vec{A}+\vec{B}| = 3$ then $\phi = \arccos(\frac{3^2-4^2-5^2}{40})$ similarly if $|\vec{A}-\vec{B}| = 3$ then $\phi = \arccos(\frac{3^2-4^2-5^2}{-40})$

- Ch-4:34 (a) $t = \sqrt{\frac{2.0}{9.81}} = 0.45s$, (b) $v_x = \frac{3.0}{0.45}\frac{m}{s}$, (c) $v_{fy} = 0 - 9.81 \times 0.45 \rightarrow v = \sqrt{v_x^2 + v_f^2 y}$

- Ch-4:38 (a) $t = \frac{16.7}{40} = 0.4175s$, (b) $\Delta y = \frac{1}{2}(9.81)(0.4175)^2$

- Ch-4: 40 Assume initial velocity v then $v_x = v\cos 60, v_y = v\sin 60$ Time taken to travel $6.1m$ horizontally is $t = \frac{6.1}{v\cos 60}$. $y_f = 3.0m, y_o = 1.8m$

  Solve $3.0 = 1.8 + v\sin 60(\frac{6.1}{v\cos 60}) - \frac{1}{2}(9.81)(\frac{6.1}{v\cos 60})^2$

- Assume that x_o is the horizontal distance along the hill for the point where the projectile lands.

  Solve $y(t) = y_o + 75\sin 60t - \frac{1}{2}gt^2$ for $y_o = 0$ and $y_f = \tan 20(300 + x_o) - 109$. Find time t_1, t_2 in terms of x_o.

  Time taken to travel horizontal distance $300 + x_o$ is $t = \frac{300+x_o}{75\cos 60}$. Using $t_2 = t$ find x_o. Rest is trivial.

  Additional Problem

  (a) $v_{ox} = 10\cos 10, v_{oy} = 10\sin 60$
  (b) $v_x(t) = v_{ox}$ **,** $v_y(t) = v_{oy} - gt$
  (c) $x(t) = x_o + v_{ox}t$**,** $y(t) = y_o + v_{oy}t - \frac{1}{2}gt^2$ **where** $y_o = 1.0m, g = 10$

(d) Solve for $y(t) = 0$ **let call the solution** t_o
(e) Use t_o **from above and plug in** $x(t) = x_o + v_{ox}t$**.**
(f) Use t_o **to find** $v_y(t = t_o) = v_{oy} - gt_o$
$v = \sqrt{v_{ox} + v_y^2(t = t_o)}$ **and angle it makes with downward vertical is** $\theta = \arctan \frac{v_{ox}}{v_y(t=t_o)}$