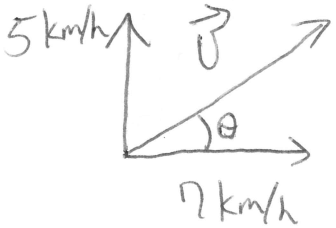
HW #1

Ch. 1 #44



$|\vec{v}| = \sqrt{5^2+7^2} = \sqrt{25+49} = \sqrt{74} = \boxed{8.6\ \text{km/h}}$

$\tan\theta = \frac{5}{7}$

$\theta = \boxed{35.5^\circ \text{ or } 0.62\ \text{rad}}$

1 pt for picture
2 pts for magnitude
2 pts for angle

Ch. 1 #51

a) $|\hat{i}+\hat{j}+\hat{k}| = \sqrt{1^2+1^2+1^2} = \sqrt{3}$ NOT a unit vector

b) No, if any component >1, magnitude will be >1

c) $\vec{A} = a(3.0\hat{i}+4.0\hat{j})$

$|3.0\hat{i}+4.0\hat{j}| = \sqrt{3^2+4^2} = \sqrt{16+9} = \sqrt{25} = 5$

$a = \boxed{\frac{1}{5}}$

1 pt for a)
1 pt for b)
3 pts for c)

Ch. 2 #49

$\Delta x = v_0 t + \frac{1}{2}at^2 \quad v_0 = 0$ (+1)

$h = \frac{1}{2}at^2$

On Earth

(+2)

$h = \frac{1}{2}(9.8)(1.75)^2 = 15\,m$

On Enceladus

$h = \frac{1}{2}at^2$

(+2)

$a = \frac{2h}{t^2} = \frac{2(15\,m)}{(18.6\,s)^2} = \boxed{0.087\,m/s^2}$

Ch. 2 #54

a) 10 mi. at 8 mi/h (+2)

$t_1 = \frac{10\,mi}{8\,mi/h} = 1.25\,h.$

20 mi. at 4 mi/h.

$t_{tot} = \frac{20\,mi}{4\,mi/h} = 5\,h.$

$t_2 = 5 - 1.25 = 3.75\,h.$

$v_2 = \frac{10\,mi}{3.75\,h} = \boxed{2.7\,\frac{mi}{h}}$

b) 20 mi at $12\,\frac{mi}{h}$ (+2)

$t_{tot} = \frac{20\,mi}{12\,mi/h} = 1.7\,h.$

$t_2 = 1.7\,h - 1.25\,h = 0.42\,h.$

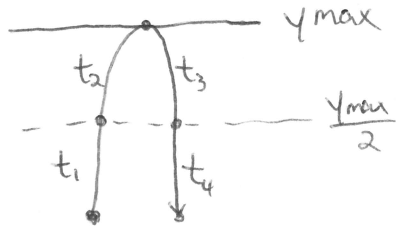
$v_2 = \frac{10\,mi}{0.42\,h} = \boxed{24\,\frac{mi}{hr}}$

c) 20 mi at 16 mi/h (+1)

$t_{tot} = \frac{20}{16} = 1.25\,h.$ however, we already rode for 1.25 h for the first 10 miles, so we have no leftover time to ride the final 10 miles.

NOT POSSIBLE

Ch. 2 #96



$t_1 + t_2 + t_3 + t_4 = 1s.$

$t_1 + t_2 = t_3 + t_4 = 0.5 s.$

$t_1 = t_4 \quad t_2 = t_3$

so ratio of time above $y_{max}/2$ to below $y_{max}/2 = \frac{t_2}{t_1} = \frac{t_3}{t_4}$

time to top of jump $= 0.5 s.$ (+1)

$v_f = v_0 + at$

$0 = v_0 + (-9.8 \, m/s^2)(0.5 s)$

$v_0 = 4.9 \, m/s$

$y_{max} = v_0 t + \frac{1}{2} a t^2$

$= 4.9(0.5) + \frac{1}{2}(-9.8)(0.5)^2$

$= 2.45 - 1.225$

$= 1.225 \, m$ (+2)

$\frac{y_{max}}{2} = v_0 t_{1/2} + \frac{1}{2} a t_{1/2}^2$

$0.6125 = 4.9 t_{1/2} - 4.9 t_{1/2}^2$

$t_{1/2}^2 - t_{1/2} + 0.125 = 0$

$t_{1/2} = \frac{1 \pm \sqrt{1 - 0.5}}{2} = \frac{1 \pm \sqrt{0.5}}{2}$

$= 0.15 s$ or $0.85 s.$

one is end of t_1, other is end of t_3

so time to half height ($t_{1/2}$) is $0.15 s.$

$t_1 = 0.15 s$

$t_1 + t_2 = 0.5 s.$ (+2)

$t_2 = 0.5 - 0.15 = 0.35 s.$

$\frac{t_2}{t_1} = 2.3$ — you spend 2.3x more time above half height than below.