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Score: 19/25

2: Estimations and Unit Analysis

1) a) Speed = distance / time = .5km / 1.5s = .33km/s × 1000m / 1km = 333.3 m/s

b) 333m/s × 1km/1000m × 3600s/1h = 1,198.8 Km/h

2) a) .25m³ → cm³ .25m³ × 100cm/1m × 100cm/1m × 100cm/1m = 250,000 cm³

b) 100km/h → m/s 100km/h × 1000m/1km × 1h/3600s = 27.7m/s

c.) 2kg m s⁻² → gm cm ms⁻²

2kgm/s² × 1000gm/1kg × 100cm/1m × 1sec/1000ms × 1sec/1000ms = 0.2 gm cm / ms²

3: Vectors

1) a.) $\vec{X}_1 = (9.66\hat{\imath} + 2.59\hat{\jmath})$m

10m cos 15° = 9.66

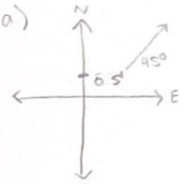
sin 15° = 2.59

b.) $\vec{X}_2 = (-14.14\hat{\imath} + 14.14\hat{\jmath})$m

20m cos 135° = -14.14

sin 135° = 14.14

2) a)



b) $\vec{X}_1 = 0.5\hat{\imath} + 0.5\hat{\jmath}$

$\vec{X}_2 = 0.18\hat{\imath} + .18\hat{\jmath}$

$= (.68\hat{\imath} + .68\hat{\jmath})$km

.25km cos 45°

c.) dist = $\sqrt{(1.68)^2 + (1.68)^2}$

$\vec{X}_{TOT} = 0.96$km

4: Motion Along a Straight Line

1) a.) x(2) = -1.0 - 4.0(2)

= -1 - 8

= -9

-9 - 7 = -16m

x(-2) = -1 - 4.0(-2)

= -1 + 8

= 7

b.) -16/4 = -4m/s

(-1) Graph should be linear

2.) x(t) = -2t + 7t²

a) x(2) = -7(2) + 7(2)²

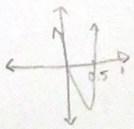
= -14 + 28

= 24

x(0) = 0

24/2 = 12m/s

b)



c) x(1) = -2(1) + 7(1)²

= -2 + 7

= 5m/s

d.) 12m/s

(-1) a=14 m/s^2

(-1) This is the position

3.) a) v(t) = vi + at

t = vi/a

t = 10m/s / 5m/s² = 2.0s

b.) x(2) = ½ 5.0(2)² + 10(2)

= 10 + 20

= 30m

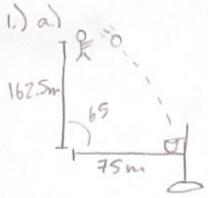
c) 100m / 10m/s = 10 seconds

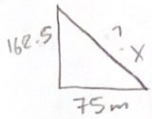
(Would be 11 seconds)

(-1) The initial velocity is zero
otherwise this would have been 10m

5: Motion in Two and Three Dimensions

1.) a)





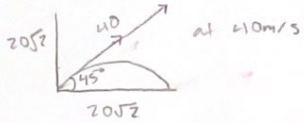
b.)

$\frac{162.5}{75} = 2.16\overline{6}$

$\tan^{-1}(2.16\overline{6}) = \boxed{65.16^\circ}$

(-1) So what is the velocity required?

2.)



b) $\Delta t = \frac{v_f - v_i}{g} = \frac{0 - 20\sqrt{2}}{-9.8} = 2.885 \times 2 = \boxed{5.77s}$

a.) $20\sqrt{2} \times 5.77 = \boxed{535ft}$

6: Forces

$F_{NET} = m\vec{a}$

$a = ?$

$a = \frac{F}{m}$

$= F_1$ $10\sin 45 = 7.07$ $10\cos 45 = 7.07$

$= F_2$ $8\sin 30^\circ = 4$ $8\cos 30^\circ = 6.92$

$\sin = 11.07$

$\cos = 13.99$

$X_{TOT} = \sqrt{(x)^2 + (y)^2}$

$= \sqrt{(13.99)^2 + (11.07)^2}$

$= \sqrt{195.72 + 122.54}$

$X_{TOT} = 17.84$

$a = \frac{17.84N}{49.00kg} = \boxed{.36 m/s^2}$

(-1) The forces have to combine like vectors, and then subtract the friction