Santiago Bermudez
12-12-20
Phys IA

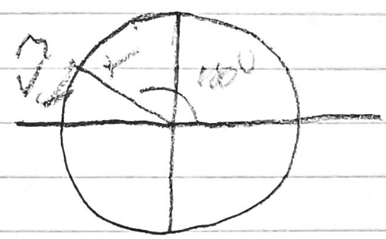
Final Exam

4. $x(t) = -4t^3 + 3t + 24$

$v(t) = -12t^2 + 3$

$a(t) = -24t$

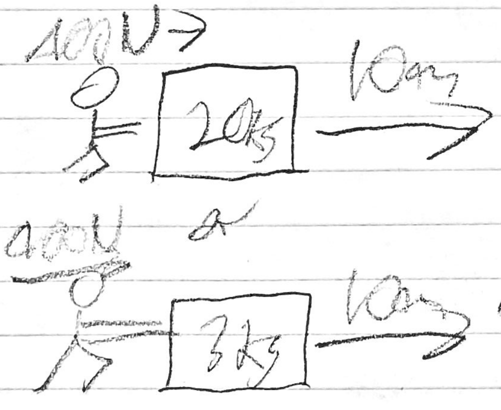
$-24 \cdot 4 = \boxed{-96\ m/s^2}$

5. 

$r = 0.5m$
$m = 0.3kg$
$v = 3m/s$

$\vec{a} = \frac{v^2}{r} = \frac{(3)^2}{0.5} = 18$

$\boxed{a = 18\ m/s^2}$

6. 

$KE = \frac{1}{2}mv^2$

Same energy I believe?

7. a is greatest, then c, then d, then b

b is least

$\boxed{F_a > F_c > F_d > F_b}$

Santiago Ramirez
12-17-16
Physics HA

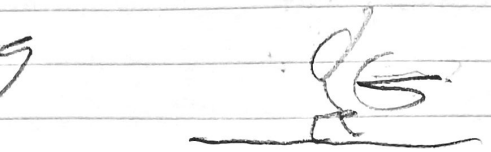
11. $F_K = \mu_K F_N$

$m = 80 kg$

$\mu_K = 0.5$

$\mu_S = 0.62$

$f_{s\,max} = \mu_S F_N$



about to slide when $f_s = f_{s\,max}$

$F_N = mg - F_{net}(0)$

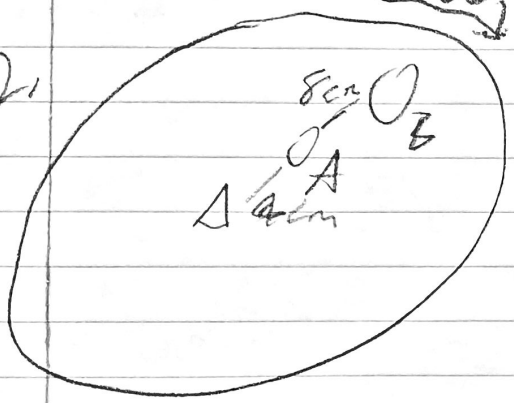
$= 80(9.8) = 784$

N

$f_{s,max} = 0.62(784)$

$= 486.06\ N$

12.



$v = \frac{s}{t}$

$v_2 = \frac{\theta}{t}$

or

$v_2 = \omega$

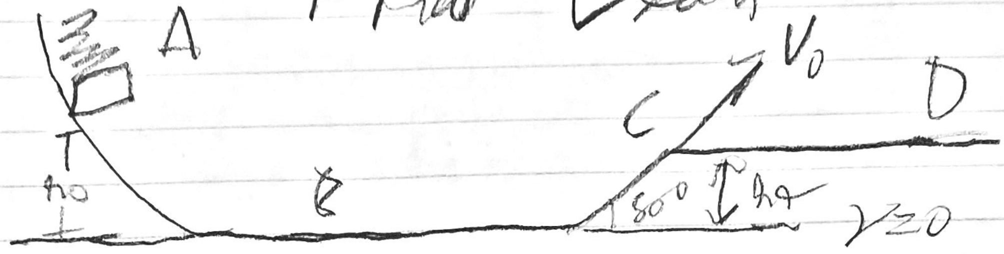
$v_A = 4\omega \quad v_B = 8\omega$

$|v_A| = \frac{1}{2}|v_B|$

Sanders Bermudez
12-17-20
Phys 1A

Final Exam

14.



a) m = 4 kg h_f = 5 m

h_0 = 20 m PE = mgh

k = 600 N/m = 4(9.8) 20 m
= 784 N

PE(of spring) = $\frac{1}{2}kx^2$

= $\frac{1}{2}$600 $(0.75)^2$

= 168.75

168.75 + 784 = 952.75 J ← (a)

gets converted to KE as it reaches ground, also considered tot. energy

b) h_f = 5 m
θ = 50°

PE = mgh

4(9.8)(5 m) = 196

KE = tot energy − pot energy
= 952.75 − 196 = 756.75

PE = 196 J
KE = 756.75 J ← (b)

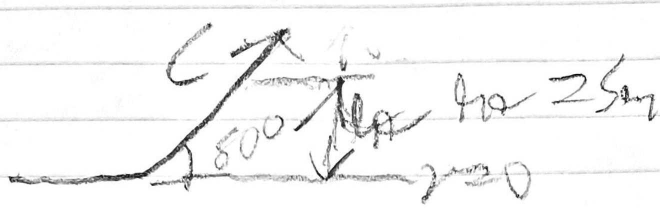
cont'd

Cont'd

vs. From previous problem

a) $PE = 196\,J$ $\quad KE = \frac{mv^2}{2}$ or $v = \sqrt{\frac{2KE}{m}}$

$KE = 786.75\,J$



$v = \sqrt{\frac{2(786.75)}{4\,kg}} = 19.45\,m/s$

$19.45 \sin(50°) = 14.9\,m/s$

$19.45 \cos(50°) = 12.5\,m/s$

$14.9^2 + 12.5^2 = c^2$? ✓

so,

(a) $\vec{v} = (12.5\,m/s)\,\hat{i} + (14.9\,m/s)\,\hat{j}$

Cont'd

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12-17-20
Phys 11A

Final Exam

(cont'd)

$-\frac{1}{2}gt$

15. (b) Max height?

Find when $v = 0$ in y-direction ~~for~~ ~~acceleration~~

pos $y(t) = -\frac{1}{2}g(t)^2 + V_{oy}t + ~~y_0~~$

$0 = -\frac{1}{2}(9.8)(t)^2 + (14.9)t$

$y(1.52) = -\frac{1}{2}(9.8)(1.52)^2 + (14.9)(1.52)$

$= -(4.9)2.3 + (14.9)(1.52)$

$= -11.32 + 22.65$

$y(1.52) = 11.32m$

$v(t) = g t + V_{oy}$

$0 = -(9.8)t + 14.9$

$-14.9 \quad -14.9$

$\frac{-14.9}{-9.8} = \frac{-9.8t}{-9.8}$

$t = 1.52s$

Max y-pos: 11.32m

(b)

$a(t) = g$

-9.8

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12-12-20
#? s 16

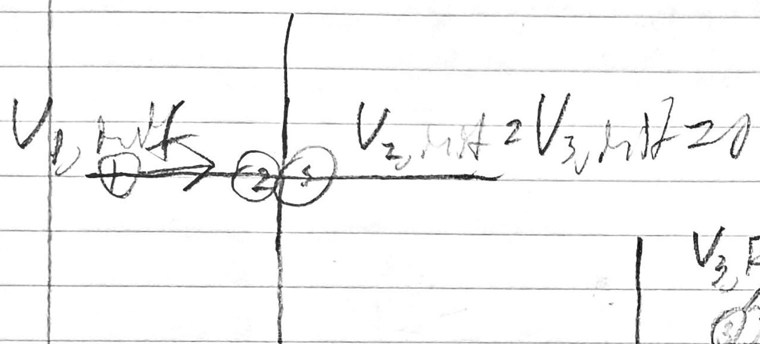
16. $m_1 = 0.75 kg$, $m_2 = 1.5 kg$, $m_3 = 1.25 kg$

$V_{1,init} = (6 m/s)\hat{i}$ $V_{2,init} = 0 m/s$

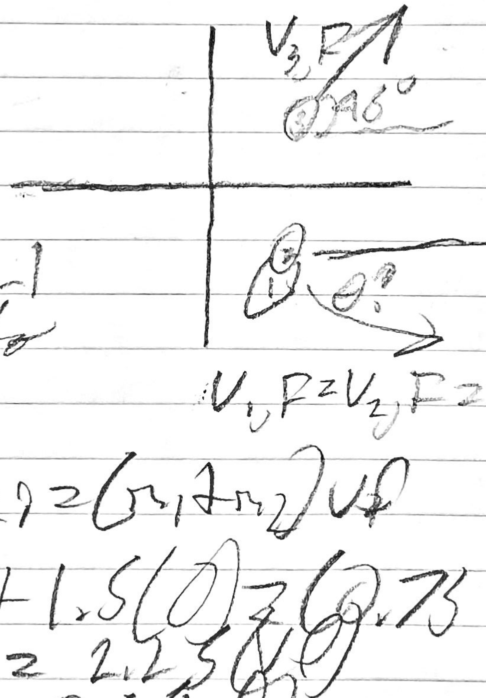
$V_{3,init} = 0 m/s$

$|V_{3,F}| = 2 m/s$, at 45°

b-1 and b-2 stick together



a) Momentum of b-1 and b-2 after collision?



$m_1 V_{1i} + m_2 V_{2i} = (m_1 + m_2) V_f$

$0.75(6 m/s) + 1.5(0) = (0.75 + 1.5) V_f$

$4.5 + 0 = 2.25(V_f)$

$\frac{4.5}{2.25} = \frac{2.25(V_f)}{2.25}$

$V_f = 2 m/s$

cont'd

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12-17-20
Phys 1H

Final Exam

8a)

$0.75(...)\cos(0°) + 1.5(0) + 1.25(0) = 4.5$

$4.5 = (0.75+1.5)V_0 + (1.25)\ 2\cos(45)\ 2\sin(45)$

2 m/s total

$4.5 - 2.5 = 2.0$ 2.5

$\frac{2.0}{2.25} \approx 0.88$ m/s

1.41 m/s

80

1.41 m/s 27 = 2 1.41 m/s V

2 1.4 m/s

So, 2.25 × 1.41

a

$\vec{P} = (3.18\ kg\,m/s)\hat{i} + (3.18\ kg\,m/s)\hat{j}$

b) $\theta = 45°$

Best guess!

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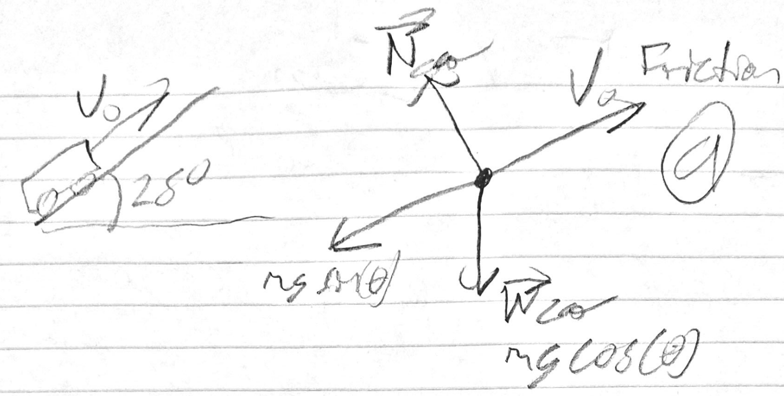
12-17-20
Phys 11A

12.



(a)

(b) $m = 1280 kg$ $\theta = 28°$
$V_0 = 16 m/s$ Force of Engine = 5660 N

$\mu_s = 0.4$ $\mu_k = 0.06$

Δ dist = 0.78 km

Magnitude of frictional force:

$F_k = \mu_k F_N$

$f_s = \mu_s F_N$

$= 0.4(11102)$

$f_s = 4440 N$

$F_n = mg\cos(\theta)$
$= 1280(9.8)\cos(28)$
$= 11102 N$

Friction = 4440 N, 28° down x-axis

CAT

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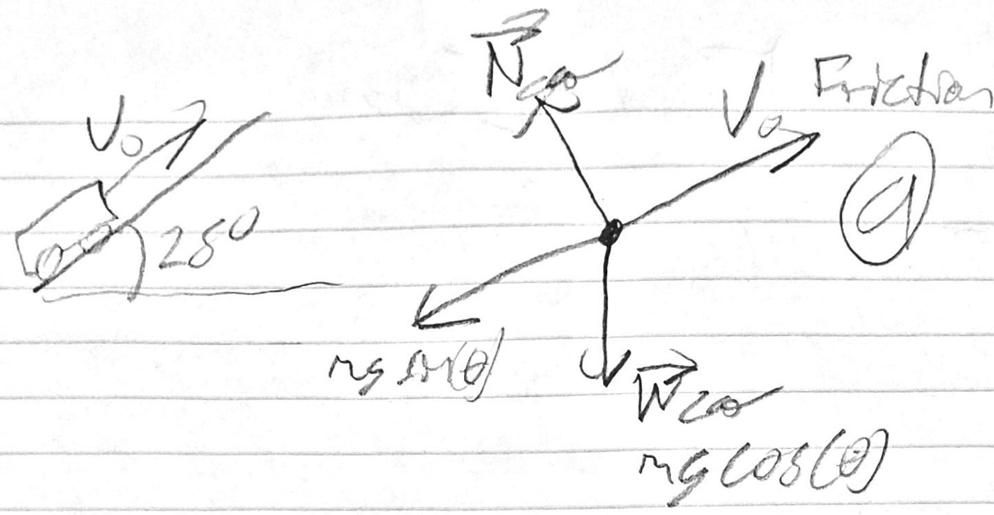
12-17-20
Physics 11A

12.



(b) $m = 1280kg$ $\theta = 28^0$
$v_0 = 16 m/s$ Force of Engine = 5660N

$\mu_s = 0.4$ $\mu_k = 0.06$

Δ dist = 0.78km

Magnitude of frictional force.

$F_k = \mu_k F_N$

$f_s = \mu_s F_N$

$= 0.4(11102)$

$f_s = 4440 N$

$F_N = mg\cos(\theta)$

$= 1280(9.8)\cos(28)$

$= 11102 N$

Friction = 4440N, 25° down x-axis

Cont'd

Santiago Bermudez
12-17-20
Class III

Final Exam

Part 4

4a. Cont'd from last problem

a) Magnitude of acc?

$a = g\frac{\cos\theta}{\sin\theta}$ or $a = \mu_s g$

$= 0.4(9.8)$

$= 3.92\ m/s^2$ ← a)

b)