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Algebra-Based Physics - 1: Midterm 1

Unit 0:

1) C

2) C

3) $\frac{25\ m}{1\ s} \cdot \frac{1\ km}{1000\ m} \cdot \frac{3{,}600\ s}{1\ hr} = 90\ km/hr$ D

4) $a = \frac{10\ km/hr}{60\ s} = \frac{1}{6}\ km\ hr^{-1}\ s^{-1}$ C

5) A

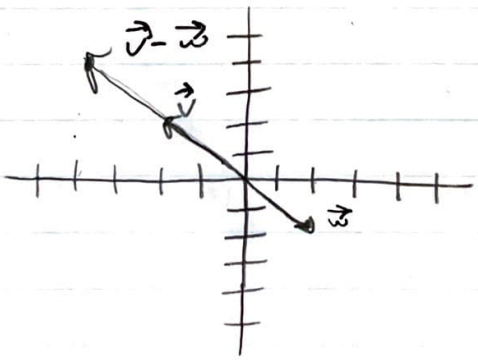
6) $2 \times 600\ cm^2 = 2000 cm^3$

$\frac{2000\ cm^3}{.5 cm^3} = 4000$ C

7) D

8) A

9)



b) $\vec{v}+\vec{w} = 0\hat{i}+0\hat{j}$

c) $\vec{v}-\vec{w} = -4\hat{i}+4\hat{j}$

e) $\vec{v}\cdot\vec{w} = -4\hat{i}-4\hat{j}$

Unit 1:

1) a) $v = 15 + 3(4)^2$

$v = 27\ m/s$

b) $15(4) + \frac{1}{2}(3)4^2$

$60 + 24$

84 km

c) Instantaneous velocity is different at $t = 0$ and $t = 4$

2) a) $\frac{262}{5} = 52.4\ m/s$

Speed at P = 52.4 m/s

$\frac{639}{5} = 127.6\ m/s$

Speed at Q = 127.6 m/s

b) Acceleration is positive

$\approx 5\ m/s$

3) a) $\frac{16^2}{2 \cdot 0.8} = 22.5\ m$

b) $\frac{6}{.8} = 7.5\ s$

Unit 2:

1) a) $T = \frac{1000}{\sin(7)} = 8204.7\ N$

b) $f_k = 45\ N$

$T_{11} = 8204.7 \cos(7) = 8140.1\ N$

$F_{net} = 8095.1\ N$

$a = \frac{8095.1\ N}{900\ kg}$

$a \approx 8.91\ m/s^2$

2) $v = 33.3\ m/s$

a) $\frac{0 - 33.33^2}{2 \times 100} = -5.56\ m/s^2$

b) $F = 20{,}000\ (-5.56) = -111{,}200\ N$

4) $R = \frac{v_0^2 \sin 2\theta}{g}$

$\theta = 30$

$v_0 = \sqrt{\frac{60 \cdot 9.8}{\sin(30)}} = 26.07\ m/s$

$i_0 = 26.07\ m/s$

$t = \frac{2(26.07)\sin(30)}{9.8} \approx 2.66\ s$

5)

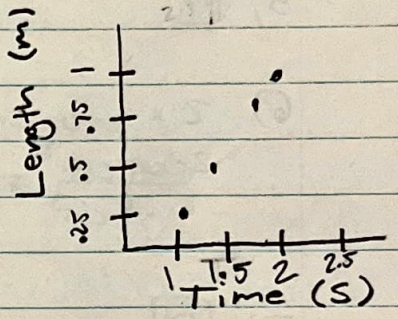
L	T
0.25	1.05
.5	1.4
.75	1.8
1	2

$s \approx 8.95\ m/s$

$g \approx 10.07\ m/s$

$s \approx 9.14\ m/s$

$\approx 9.87\ m/s$



3) a) Centripetal force $= 80{,}000 \sin(30) = 40{,}000\,N$

b) $F_c = \frac{mv^2}{r}$

$r = \frac{6000\ (166.67)}{40\,000}$

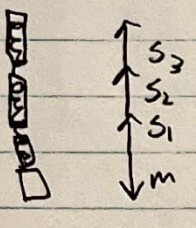
$r = 4166.67\ m$

c) Circumference $= \pi \cdot 4166.67$

$\approx 13080.64\ m$

$\epsilon = \frac{13080.64}{166.67} = 78.43\ s$

4) a)



b) $F = kx + kx + kx$

$F = 3kx$

$x = \frac{mg}{3k}$

c) As $k \to \infty$, $x \to 0$

5) a) $V = \sqrt{\frac{2.60 \cdot 9.81}{1.2 \cdot .5 \cdot .25}}$

$V = 88.5\ m/s$

b) $V = \sqrt{\frac{2.60 \cdot 9.81}{1.2 \cdot .5 \cdot .25}}$

$V = 8.85\ m/s$

6) a) $A = .03141\ m^2$

$\Delta L = \frac{10000\ N \cdot 10\ m}{.03141^2\,(45 \times 10^9)}$

$\Delta L = .0707\ mm$

b) $\frac{10000\ N \cdot 10\ m}{.03141\ m^2\,(22.5 \times 10^9)}$

$\Delta L = .141\ mm$