JAN. 9/19

- Open textbook exam (but only textbook - no notes)
↳ Feb. 13th For Midterm

Space: geometric region in which physical events of interest in mechanics occur.

Time: interval between events

Matter: any substance occupying space ↯ body is matter bounded by closed surface

Objects { Particles : point
Bodies

Force: action of one body upon another body

Newton's Laws {
- 1ST Law: Particle remains at rest / or continues to move if no unbalanced Force acting on it.
- 2ND Law: Acceleration is proportional to the force acting on it.
- 3RD Law: Action / Reaction

→ units of measurements (using both US and SI)

↳ in SI $W = m \cdot g$

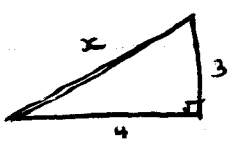
→ $(kg)(m/s^2) = N$ (newton)

↳ In US $W = m \cdot g$

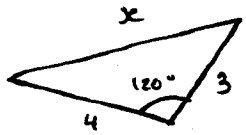
→ $m = W/g \Rightarrow \frac{lbf}{ft/s^2} = 1 \text{ slug}$

→ $\frac{lbf \cdot s^2}{ft}$

→ $2x + 4y = 8$
$3x + 2y = 8$
} Find x, y (simultaneous eqns)



↷ Pythagorean



↷ cosine

... etc.

$\sin(-\alpha) = -\sin\alpha$

$\tan\alpha = y/x$

$\alpha = \tan^{-1}(y/x) = \tan^{-1}(-1/-1) = 225°$

$\alpha = \tan^{-1}\left(\frac{1}{-1}\right) = 135°$

Machines are mechanical systems used to do all the work. Transfer motion and forces from a power source to an output.

Power: rate of doing work

Example of Mechanisms

Can crusher: 4-bar linkage

Move package from assembly bench to conveyor
↳ 6-bar linkage

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Review of Fundamentals

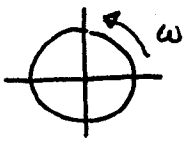
a) (1) $W = mg$, $g = 9.81\ m/s^2$, $m = 10\ kg$ $\Big\}$ $(9.81)(10) = 98\ N$

a) (2) $m = \frac{W}{g}$, $g = 32.2\ ft/s$

d) (3) $F = ma$

a) (4) $V = R\omega$

d) (5) $a_n = r\omega^2$

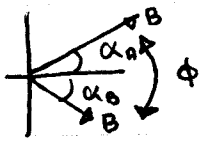


$a_t = r\alpha = 0$

c) (6) $\vec{i}$, $\vec{j}$, unit vectors

d) (7)

a) (8)



$\alpha_A = \tan^{-1}(4/5)$

$\alpha_B = \tan^{-1}(3/2)$

OR $\alpha = \cos^{-1}\left(\frac{\bar{A}\cdot\bar{B}}{|\bar{A}|\cdot|\bar{B}|}\right)$

(9)
$$\begin{vmatrix} i & j \\ 5 & 4 \\ 2 & -3 \end{vmatrix}$$

$M_o = \vec{F} \times \vec{R}$

$M_o = (5)(-3) - (4)(2)$

$= -23\vec{k}\ N\cdot m$ ×

Should be $\vec{R} \times \vec{F}$ → $23\vec{k}\ N\cdot m$

(10) total mass = 10 + 10 = 20

$$\bar{x} = \frac{m_1\bar{x}_1 + m_2\bar{x}_2}{m_1 + m_2}$$