

**Problems**

1. A force of 1.2 N [ $\leftarrow$ ] is applied to an object of mass 1.5 kg. It accelerates at 0.50 m/s<sup>2</sup> [ $\leftarrow$ ] along a surface. Determine the force of friction that is acting and the coefficient of kinetic friction involved.



From x dir:

$$\begin{aligned} F_{app} - F_f &= ma \\ F_f &= F_{app} - ma \\ F_f &= 1.2\text{ N} - (1.5\text{ kg})(0.50\text{ m/s}^2) \\ F_f &= 0.45\text{ N} \\ F_f &= 0.45\text{ N } [\rightarrow] \end{aligned}$$

From y dir:

$$\begin{aligned} F_N - F_g &= 0 \\ F_N &= F_g \\ F_f &= \mu F_N \\ \mu &= \frac{F_f}{F_N} \\ \mu &= \frac{0.45\text{ N}}{(1.5\text{ kg})(9.8\text{ m/s}^2)} \\ \mu &= 0.03 \end{aligned}$$

2. Two children pull a toy truck of mass 2.4 kg along a rough horizontal surface. One child pulls with a force of 8.4 N [N] and the other pulls with a force of 3.6 N [S]. The coefficient of friction between the toy and surface is 0.18. What is the acceleration of the toy?



$$\begin{aligned} \Sigma F_y &= F_N - F_g = 0 \\ F_N - F_g &= 0 \\ F_N &= F_g \end{aligned}$$

$$\begin{aligned} \Sigma F_x &= F_1 - F_2 - F_f = ma \\ a &= \frac{F_1 - F_2 - \mu mg}{m} \\ a &= \frac{8.4\text{ N} - 3.6\text{ N} - (0.18)(2.4\text{ kg})(9.8\text{ m/s}^2)}{2.4\text{ kg}} \\ a &= 0.236\text{ m/s}^2 \\ a &= 0.24\text{ m/s}^2 \text{ [N]} \end{aligned}$$

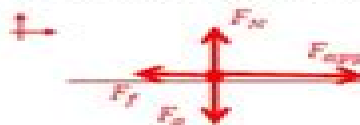
3. What minimum magnitude of force would be required to start a 1.0-kg object sliding along a horizontal surface if the coefficient of static friction is 0.20?



$$\begin{aligned} \Sigma F_y &= F_N - F_g = 0 \\ F_N - F_g &= 0 \\ F_N &= F_g \end{aligned}$$

$$\begin{aligned} \Sigma F_x &= F_{app} - F_f = ma \\ F_{app} - F_f &= 0 \\ F_{app} &= \mu mg \\ F_{app} &= (0.20)(1.0\text{ kg})(9.8\text{ m/s}^2) \\ F_{app} &= 1.96\text{ N} \\ F_{app} &> 2.0\text{ N} \end{aligned}$$

4. Show that an applied force of 4.0 N is insufficient to get a stationary 2.0-kg object to move horizontally if the coefficient of starting friction is 0.25.



$$\begin{aligned} \Sigma F_y &= F_N - F_g = 0 \\ F_N - F_g &= 0 \\ F_N &= F_g \end{aligned}$$

$$\begin{aligned} \Sigma F_x &= F_{app} - F_f = ma \\ F_{app} - F_f &> 0? \\ F_{app} - \mu mg &> 0? \\ 4.0\text{ N} - (0.25)(2.0\text{ kg})(9.8\text{ m/s}^2) &> 0? \\ -0.9\text{ N} &> 0? \end{aligned}$$

Since the applied force is not large than the force of static friction, their sum is less than 0 N and therefore insufficient to get the object moving.

# Dynamics Problems And Solutions

**Lingsheng Yao**



## **Dynamics Problems And Solutions :**

*The Theory of Problem-Solution Dualities and Polarities* Kofi Kissi Dompere, 2022-04-25 This book is concerned with the development of the understanding of the relational structures of information knowledge decision choice processes of problems and solutions in the theory and practice regarding diversity and unity principles of knowing science non science and information knowledge systems through dualistic polar conditions of variety existence and nonexistence It is a continuation of the sequence of my epistemic works on the theories on fuzzy rationality info statics info dynamics entropy and their relational connectivity to information language knowing knowledge cognitive practices relative to variety identification problem solution dualities variety transformation problem solution dualities and variety certainty uncertainty principle in all areas of knowing and human actions regarding general social transformations It is also an economic theoretic approach in understanding the diversity and unity of knowing and science through neuro decision choice actions over the space of problem solution dualities and polarities The problem solution dualities are argued to connect all areas of knowing including science and non science social science and non social science into unity with diversities under neuro decision choice actions to support human existence and nonexistence over the space of static dynamic dualities The concepts of diversity and unity are defined and explicated to connect to the tactics and strategies of decision choice actions over the space of problem solution dualities The concepts of problem and solution are defined and explicated not in the space of absoluteness but rather in the space of relativity based on real cost benefit conditions which are shown to be connected to the general parent offspring infinite process where every solution generates new problems which then generates a search for new solutions within the space of minimum maximum dualities in the decision choice space under the principle of non satiation over the space of preference non preference dualities with analytical tools drawn from the fuzzy paradigm of thought which connects the conditions of the principle of opposites to the conditions of neuro decision choice actions in the zone of variety identifications and transformations The Monograph would be useful to all areas of Research Learning and Teaching at Advanced Stages of Knowing and Knowledge Production [Solutions to the Frictional Dynamics Problem and the Reciprocal Variable Feedback Methodology for Design and Control of Robot Mechanisms](#) Aristides Gogoussis, 1989

[Thermo-Dynamics of Plates and Shells](#) Jan Awrejcewicz, Vadim Anatolevich Kryz'ko, Anton V. Kryz'ko, 2007-02-15 This monograph is devoted to nonlinear dynamics of thin plates and shells with thermosensitive excitation Because of the variety of sizes and types of mathematical models in current use there is no prospect of solving them analytically However the book emphasizes a rigorous mathematical treatment of the obtained differential equations since it helps efficiently in further developing of various suitable numerical algorithms to solve the stated problems [Process Dynamics and Control](#) Dale E. Seborg, Thomas F. Edgar, Duncan A. Mellichamp, Francis J. Doyle, III, 2016-11-16 The new 4th edition of Seborg's *Process Dynamics and Control* provides full topical coverage for process control courses in the chemical engineering curriculum

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