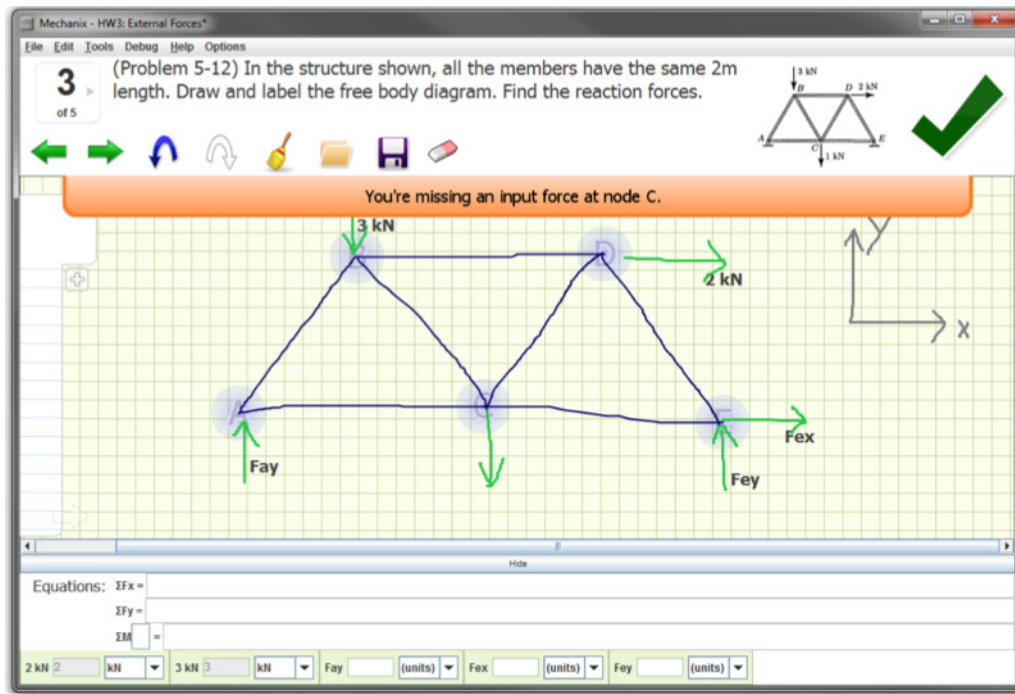


Mechanix: A Sketch-Based Homework System for Physics



About Mechanix

- **Mechanix** is a sketch recognition system to automatically correct hand drawn homework solutions for free body diagrams.
- Free body diagrams are used to teach a number of engineering concepts.
- We have used the system for three semesters at TAMU in Engineering 111 and one semester at La Tourneau.
- All TAMU engineering students are required to take Engineering 111, thus the concepts are required for a variety of subjects.

Project Website

- <http://sketchmechanix.com>
- (Sample version is downloadable from there, as well as a tutorial video.)

Student/Instructor Version Login Credentials

- **username:** testX (where X is the number provided to you on the index card, e.g., test1)
- **password:** test

Contact Information



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Mechanix: A Sketch-Based Homework System for Physics (cont'd)

Mechanix & Applicable TEKS Standards (Bold are Direct Concepts, Non-bold are Indirect Concepts)

§112.39. Physics

(c) Knowledge and skills.

(4) Science concepts.

(E) develop and interpret free-body force diagrams

§111.35. Mathematics - Precalculus

(c) Knowledge and skills.

- (1) The student defines functions, describes characteristics of functions, and translates among verbal, numerical, graphical, and symbolic representations of functions, including polynomial, rational, power (including radical), exponential, logarithmic, trigonometric, and piecewise-defined functions.
 - (A) describe parent functions symbolically and graphically, including $f(x) = x^n$, $f(x) = \ln x$, $f(x) = \log_a x$, $f(x) = 1/x$, $f(x) = e^x$, $f(x) = |x|$, $f(x) = ax$, $f(x) = \sin x$, $f(x) = \arcsin x$, etc.;
 - (B) determine the domain and range of functions using graphs, tables, and symbols;
 - (C) describe symmetry of graphs of even and odd functions;
 - (D) recognize and use connections among significant values of a function (zeros, maximum values, minimum values, etc.), points on the graph of a function, and the symbolic representation of a function; and
 - (E) investigate the concepts of continuity, end behavior, asymptotes, and limits and connect these characteristics to functions represented graphically and numerically.
- (2) The student interprets the meaning of the symbolic representations of functions and operations on functions to solve meaningful problems.
 - (A) apply basic transformations, including $a \cdot f(x)$, $f(x) + d$, $f(x - c)$, $f(b \cdot x)$, and compositions with absolute value functions, including $|f(x)|$, and $f(|x|)$, to the parent functions;
 - (B) perform operations including composition on functions, find inverses, and describe these procedures and results verbally, numerically, symbolically, and graphically; and
 - (C) investigate identities graphically and verify them symbolically, including logarithmic properties, trigonometric identities, and exponential properties.
- (3) The student uses functions and their properties, tools and technology, to model and solve meaningful problems. The student is expected to:
 - (A) investigate properties of trigonometric and polynomial functions;
 - (B) use functions such as logarithmic, exponential, trigonometric, polynomial, etc. to model real-life data;
 - (D) use properties of functions to analyze and solve problems and make predictions; and
 - (E) solve problems from physical situations using trigonometry, including the use of Law of Sines, Law of Cosines, and area formulas and incorporate radian measure where needed.
- (6) The student uses vectors to model physical situations. The student is expected to:**
 - (A) use the concept of vectors to model situations defined by magnitude and direction; and**
 - (B) analyze and solve vector problems generated by real-life situations.**

Sample Physics Assignments for Use in Your Classroom

- <http://www.uilTEXAS.org/files/academics/Science-Physics-Sample-Lessons.pdf>
- <http://www.physics.smu.edu/sdalley/MPTC/STAAR-EOC-TestPhysics.pdf>