Using ALEKS

Mastery Learning
with Technology

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What is Mastery Learning?

- A shift in education paradigm which was first introduced by John B. Carroll in 1963
- Mastery learning places emphasis on time required for different students to learn the same material. (Classic model which provides for same amount of time and the focus is on differences in ability)
- Key elements in mastery learning are:
  1. Clear identification of objectives, that is what is to be learned and how it will be evaluated;
  2. Some allowance for students to learn at their own pace;
  3. Ongoing assessment of student progress and providing appropriate feedback or remediation;
  4. Implementation of assessment tools which verify that the final learning criterion has been achieved

What is ALEKS?

A tool to implement a mastery learning strategy

- ALEKS is the result of an NSF grant to a team of software engineers, mathematicians and cognitive scientists and is based upon "Knowledge Space Theory" proposed by Dr. Jean-Claude Falmagne.
- Provides for identification of specific objectives thus setting a curriculum and set of objectives for students to work;
- Starts with a rigorous assessment of a students knowledge base;
- Provides a very direct path for the student to reach the objectives set by the curriculum;
- Provides a mechanism to track the progress of the class as well as individual students.

Ready to Learn


Course Mastery
(127 of 175 Topics)
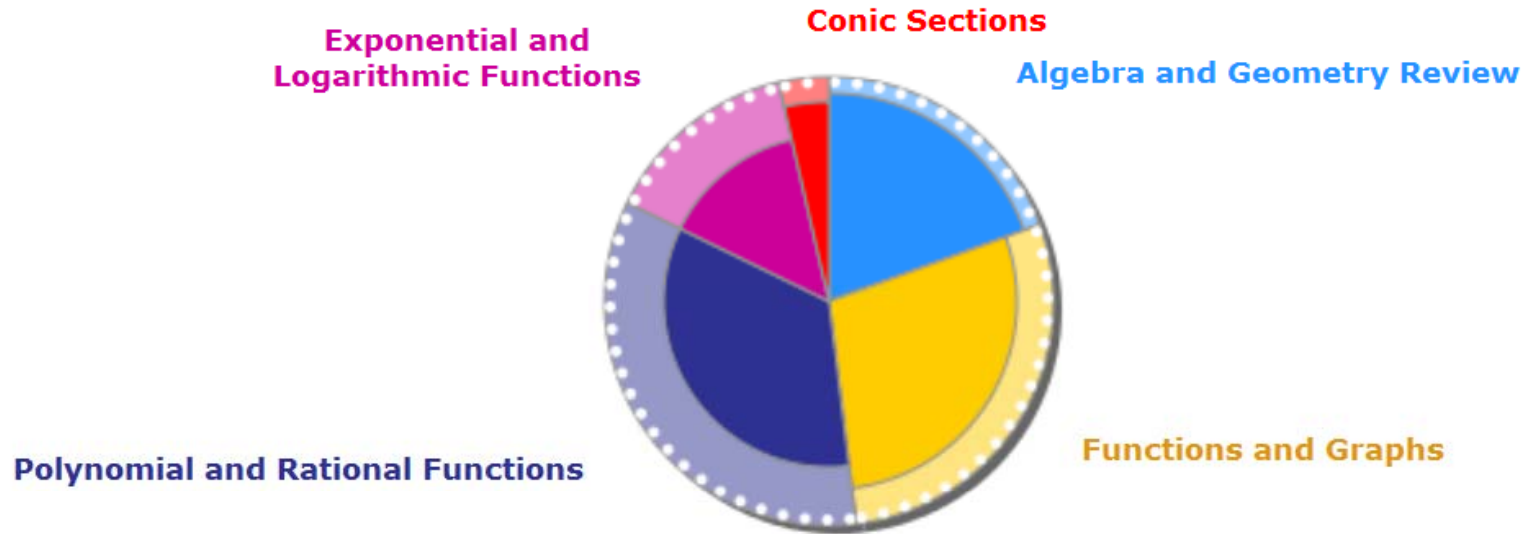
ALEKS from Student's Perspective

- Purchase access (McGraw-Hill or bookstore)
  - Six-week, one-semester, two-semester accesses available
- Self-enroll into the class (academic unit or instructor provides the course code)
- Log into ALEKS and does
  - Tutorial
  - Initial Assessment
  - Commences working on their customized "pie"

(Go to student access)

Choosing the form of a rational function given its graph

Shown in the figure below is the graph of a rational function f with vertical asymptotes $x=3$, $x=-4$, and horizontal asymptote $y=-3$. (All x-intercepts of the graph of f are also shown, and a point on the graph is indicated.) The equation for $f(x)$ has one of the five forms shown below. Choose the appropriate form for $f(x)$, and then write the equation.
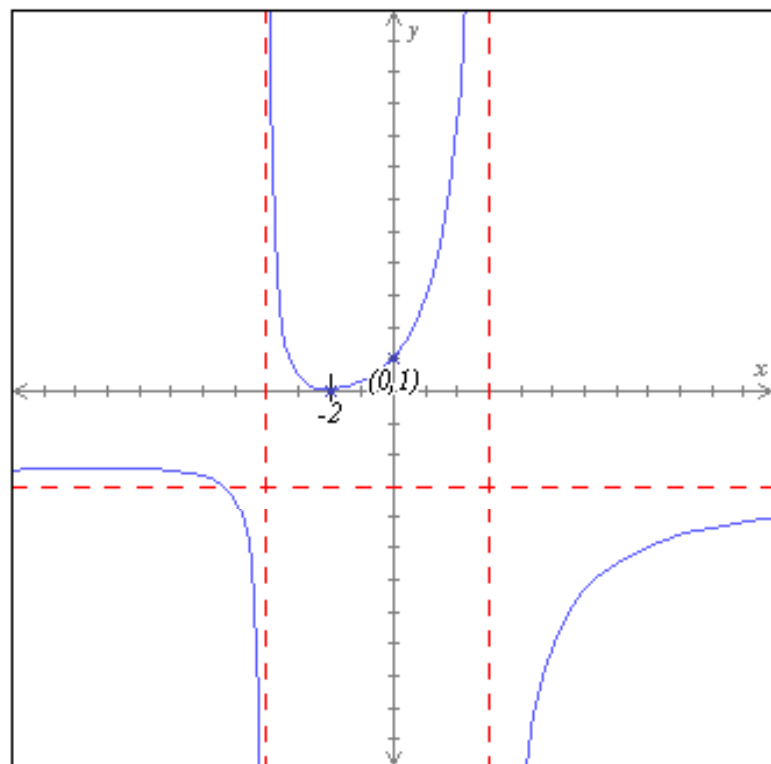
○ $f(x) = \dfrac{a}{x-b}$

○ $f(x) = \dfrac{a(x-b)}{x-c}$

○ $f(x) = \dfrac{a}{(x-b)(x-c)}$

○ $f(x) = \dfrac{a(x-b)}{(x-c)(x-d)}$

○ $f(x) = \dfrac{a(x-b)(x-c)}{(x-d)(x-e)}$

ALEKS EXPLAIN:

We need to determine the equation of a rational function $f(x) = \dfrac{p(x)}{q(x)}$ given its graph. To do this, it is useful to consider the following properties:

Property 1: If $x = v$ is a vertical asymptote of the graph of f, then $x - v$ is a factor of the denominator $q(x)$.

Property 2: If r is an x-intercept of the graph of f, then r is a zero of the polynomial $p(x)$ (since r is a zero of the function f); thus, $x - r$ is a factor of the numerator $p(x)$. If there is no x-intercept, then the numerator has no real zeros.

Property 3: If $y = a$, $a \neq 0$ is a horizontal asymptote of the graph of f, then the degree of the numerator $p(x)$ equals the degree of the denominator $q(x)$, and a equals the ratio of the leading coefficient of $p(x)$ to the leading coefficient of $q(x)$.

Property 4: If $y = 0$ is a horizontal asymptote of the graph of f, then the degree of the numerator $p(x)$ is less than the degree of the denominator $q(x)$.

ALEKS

- Empowers Students to succeed
- Provides a measurement of success (assessment)
- Places the responsibility of learning directly on the student
- Identifies specifically where the student needs to focus their time – very time efficient

Confidence Building

- Students often do not believe in their own mathematical ability.

- A. Bandura coined "self-efficacy" in 1986

> People's judgments of their capabilities to organize and execute the courses of action to attain designated types of performance.

> Self-efficacy is built and/or destroyed through mastery experiences, vicarious experiences, verbal persuasion, and physiological states

Conquering Self-Doubt

- Bloom asserts
  - mastery experiences is an effective means to create self-efficacy.
  - Successes build/failures undermine
  - However, if success should not come to easily,

    Students need to learn that sustained effort is necessary to overcome the difficulties that they encounter.

    1. Struggle
    2. Organize
    3. Execute plans

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- Jump start on Math 001 content [PDF]

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