Course Review Form
Quantitative Foundations

Course: MA109 - College Algebra

Using the course syllabus as a reference, identify when and how the following learning outcomes are addressed in the course. Since learning outcomes will likely be addressed multiple ways within the same syllabus, please identify a representative example (or examples) for each outcome.

☐ 1. Students must demonstrate proficiency with number sense (e.g., order of magnitude, estimation, comparisons, effect of operations)

Date/location on syllabus or assignment:
Learning Objective #1
A Bit Of Review (2nd week)

Brief Description:

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6. ⊕ **Question Details**   120L IntroWA number tolerance_with hint [3553317]   -

Tolerance
By default, your numerical entry is scored as correct if it is within 1% of the correct answer. A rule of thumb is always to enter at least 3 digits for numerical questions. If the correct answer is 7.48709, which of the following entries would be counted as correct? That is, which entries are within WebAssign's default tolerance? (Select all that apply.)

HINT: Numbers that are "within 1% of the correct answer" are any values that are less than **the correct answer + 1%** (TOP of range) and greater than **the correct answer - 1%** (BOTTOM of range).

☐ 7.64

☐ 7.5545

☐ 7.49

☐ 7.3299

☐ 7.420

☐ 7.3

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8. ⊕ **Question Details**   Order of Operations 3 [1753907]   -

What is the order of the steps that are being applied to x?

$$2 - (x + 1)^3$$

1. [Add 1   ⬍]

2. [Raise to the Third Power ⬍]

3. [Negate   ⬍]

4. [Add 2   ⬍]

2. Students must demonstrate proficiency with functional relationships between two or more sets of variable values (i.e., when one or more variables depend upon, or are functions of, other variables)

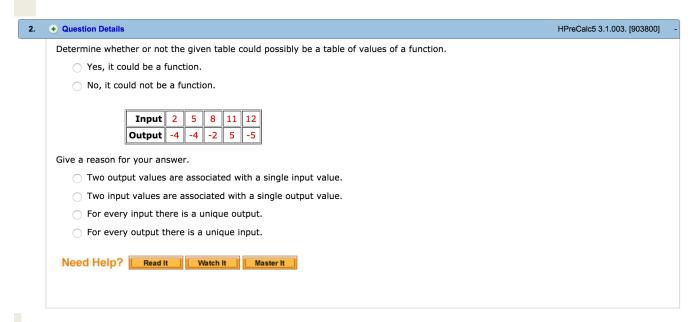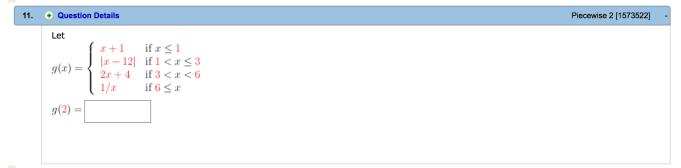Date/location on syllabus or assignment:
(Recurring theme)
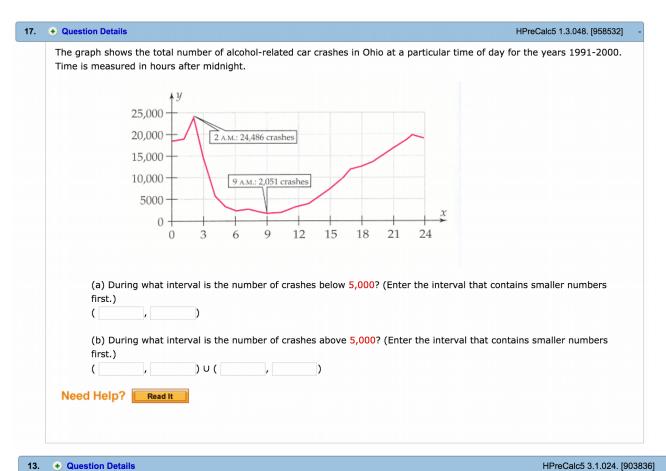Learning objectives #2 through #4
Exams 2 and 3
Systems A,B,C and Functions A-F.

Brief Description:

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2. **⊕ Question Details**   -

Determine whether or not the given table could possibly be a table of values of a function.

○ Yes, it could be a function.

○ No, it could not be a function.

Input	2	5	8	11	12
Output	-4	-4	-2	5	-5

Give a reason for your answer.

○ Two output values are associated with a single input value.

○ Two input values are associated with a single output value.

○ For every input there is a unique output.

○ For every output there is a unique input.

Need Help? [Read It] [Watch It] [Master It]

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11. **⊕ Question Details**   -

Let

$$g(x) = \begin{cases} x+1 & \text{if } x \leq 1 \\ |x-12| & \text{if } 1 < x \leq 3 \\ 2x+4 & \text{if } 3 < x < 6 \\ 1/x & \text{if } 6 \leq x \end{cases}$$

$g(2) = \boxed{}$

☐ 3. Students must demonstrate proficiency in relating different representations of such relations (e.g., algebraically or symbolically, as tables of values, as graphs, and verbally)

Date/location on syllabus or assignment:
Learning objective #3
Scattered problems on many assignments.

Brief Description:

The graph shows the total number of alcohol-related car crashes in Ohio at a particular time of day for the years 1991-2000. Time is measured in hours after midnight.

(a) During what interval is the number of crashes below **5,000**? (Enter the interval that contains smaller numbers first.)

([   ] , [   ])

(b) During what interval is the number of crashes above **5,000**? (Enter the interval that contains smaller numbers first.)

([   ] , [   ]) ∪ ([   ] , [   ])

Need Help? [Read It]

The amount of state income tax residents pay depends on their income. The way that the income determines the tax is given by the following tax law.

Income		Tax
At least	But Less Than	
$0	$15,000	$0
$15,000	$60,000	4% of amount over $15,000
$60,000		$2,400 + 10% of amount over $60,000

Find four different numbers in the domain of this function that produce the same output (number in the range). (Enter your answers from smallest to largest.)
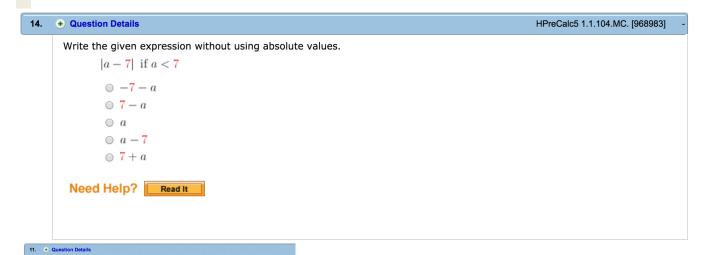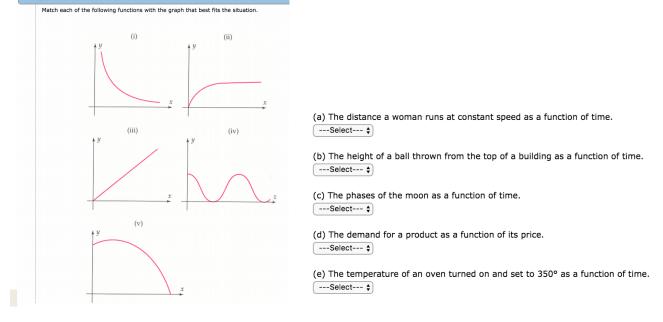
$ [   ]
$ [   ]
$ [   ]
$ [   ]

Need Help? [Read It]

☐ 4. Students must demonstrate understanding of relations between numerical values.

Date/location on syllabus or assignment:
Inequalities (8th week)

Brief Description:

Write the given expression without using absolute values.

$|a - 7|$ if $a < 7$

○ $-7 - a$

○ $7 - a$

○ a

○ $a - 7$

○ $7 + a$

Need Help?   [Read It]

Match each of the following functions with the graph that best fits the situation.

(i)   (ii)

(iii)   (iv)

(v)

(a) The distance a woman runs at constant speed as a function of time.
[---Select--- ⬍]

(b) The height of a ball thrown from the top of a building as a function of time.
[---Select--- ⬍]

(c) The phases of the moon as a function of time.
[---Select--- ⬍]

(d) The demand for a product as a function of its price.
[---Select--- ⬍]

(e) The temperature of an oven turned on and set to 350° as a function of time.
[---Select--- ⬍]

☐ 5. Students must demonstrate that they can apply fundamental elements of mathematical, logical, or statistical knowledge to model and solve problems drawn from real life.

    a) Students must be able to recast and formulate everyday problems into appropriate mathematical or logistical systems, represent those problems symbolically, and express them visually or verbally.

    Date/location on syllabus or assignment:

Learning objectives #3 and #5.
Assignment: "Applied" (9th week)

Brief Description:

A rectangle has perimeter of 45 centimeters and an area of 93.5 square centimeters. What are its dimensions?
Decide what is being asked for, and label the unknown quantities. Then translate the verbal statements in the problem and the relationships between the known and unknown quantities into mathematical language, using a table. You need not find an equation to be solved.
Please label the height of the rectangle as x and its length as y.

English Language	Mathematical Language
The height of the rectangle is ____ and the length of the rectangle is____.	
The rectangle's perimeter is 45.	
The rectangle's area is 93.5.	

English Language	Mathematical Language
The height of the rectangle is ____ and the length of the rectangle is____.	x, y
The rectangle's perimeter is 45.	$xy = 45$
The rectangle's area is 93.5.	$2x + 2y = 93.5$

A box with a square base of side y is six times higher than it is wide. Express the volume V of the box as a function of y.

$V(y) = $ [_____]

Need Help? [Read It]

A bicycle factory has weekly fixed costs of $21000. In addition, the material and labor costs for each bicycle are $145. Express the total weekly cost C as a function of the number x of bicycles that are made.

- $C = 435x + 21000$
- $C = 145x + 21000$
- $C = 145x + 20855$
- $C = 435x + 20855$
- $C = 290x + 10400$

Need Help? [Read It]

b)   Students must be able to apply the rules, procedures, and techniques of appropriate deductive systems to analyze and solve problems.

Date/location on syllabus or assignment:
Learning objectives #4 and #5.
Assignments: "Solving Equations A-D" (2nd-4th week)

Brief Description:

Solve for x.

$$\frac{5}{x-1} + \frac{3}{(x-1)(x+5)} = \frac{2}{x+5}$$

$x =$ [_____]

⊞ symbolic formatting help

Data from the U.S. Department of Health and Human Services indicates that the cumulative number N of reported cases of AIDS in the United States in year x can be approximated by the equation below, where $x = 0$ corresponds to 1980. In what year did the total reach 650000?

$$N = 3362.1x^2 - 17270x + 24043$$

○ 1995
○ 1996
○ 1999
○ 1994
○ 2000

Need Help? [**Read It**]

Find a number k such that the given equation has exactly one real solution.

$$x^2 - kx + 4 = 0$$

$k =$ [_____]

Need Help? [**Read It**]

c) Students must be able to apply correct methods of argument and proof to validate (or invalidate) their analyses, confirm their results, and to consider alternative solutions.

Date/location on syllabus or assignment:
Learning objective #1, #4, and #6
"Extraneous solutions" in Solving Equations (radical and absolute values)

Brief Description:

Solve the equation for x.

$$\sqrt{2x + 41} = x + 3$$

The standard operations to solve this problem are to "square both sides" and solve the resulting quadratic, getting 2x + 41 = (x+3)^2, then x=-8 and x=4. However x=-8 gives sqrt(25) = -5, so is not a solution to the original problem, only the transformed problem. Students must check their solutions as part of this method.

d) Students must be able to interpret and communicate their results in various forms, including in writing and speech, graphically and numerically.

Date/location on syllabus or assignment:
Learning Objective #3
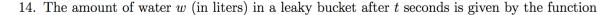Written Project (14th week)

Brief Description:
Students will present a complete analysis of a modelling problem, including supporting paragraphs of explanation, figures (graphs and tables of values), as well as a comparison of two competing possible solutions, explaining the merits and drawbacks of both.

e) Students must be able to identify and evaluate arguments that contain erroneous or fallacious reasoning, and detect/describe the limitations of particular models or misinterpretations of data, graphs, and descriptive statistics.

Date/location on syllabus or assignment:

Learning Objective #1 and #6
Sample exam question (3rd exam, 13th week)

Brief Description:

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14. The amount of water w (in liters) in a leaky bucket after t seconds is given by the function

$$w(t) = 0.1t^2 - t + 2.5$$

This reflects the swift initial decrease in volume, followed by a slower trickle. What is the most serious deficiency of this model?

Possibilities:

(a) Measuring volume in liters does not allow for small quantities of water.

(b) Harrison's law of hydraulics states that water leaves a bucket at a linear rate.

(c) After 10 seconds, the model predicts that $w(10) = 2.5$, the same value as $w(0)$, so that the bucket returns to full after draining.

(d) After 5 seconds, the model predicts that $w(5) = 0$, the bucket is empty.

(e) To determine how much water is in the bucket, one must solve a quadratic equation.

f) Students must address Information Literacy as presented within curriculum for the science of quantitative reasoning. This involves problem solving, the use of estimation, thinking strategies for basic facts, formulating and investigating questions from problem situations, use of computers and calculators, or other technologies.

Date/location on syllabus or assignment:
Learning objective #6 and #8
"Using Tech Wisely" (7th week)

Brief Description:

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14. ⊕ **Question Details**   Algebraically vs. Graphically 2 [1767406]   -

Which of the following equations should you approximate solutions to graphically? (This means that you can not solve the equation algebraically. You do not need to solve the equations.) (Select all that apply.)

☐ $x^2 + 7 = x^3 - 15$

☐ $x + 7 = \sqrt{x - 15}$

☐ $x^2 + 7 = \sqrt{x - 15}$

☐ $x^2 + 7 = x - 15$

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11. ⊕ **Question Details**   HPreCalc5 2.2.032.MC. [960122]   -

Use algebraic, graphical, or numerical methods to find all real solutions of the equation, approximating when necessary to four decimal places.

$$|x^3 + 3| = 7 + x - x^2$$

○ There are no real solutions.

○ $x \approx -1.7388, 1.4856$

○ $x \approx -1.7374, 1.4856$

○ $x \approx -1.7388, 1.4842$

○ $x \approx -1.7374, 1.4842$

Need Help?   [Read It]   [Watch It]   [Master It]

☐   At least 30% of the course addresses the items 1 – 4 on this checklist, and at least 40% of the course addresses items 5 a) – e) on the checklist.

Reviewer's Comments