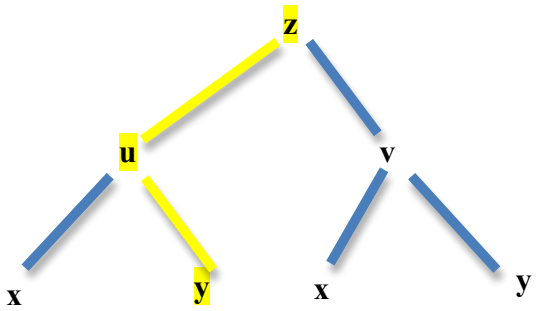
THM Content Design Document

Title: Chain Rule
Course: Calculus
Due date:
Instructions Text: Build tree diagrams to illustrate the logic behind the chain rule
Explore mode: Yes.
Special Considerations: None.

Question #

Progress Bar | Title text block

In calculating δz/δx or δz/δy, you will have to sum all the products of derivatives; the tree diagram illustrates the possible connections. Click on one variable from each tier of the tree to see the partial derivative of that branch. Press Go to Quiz to continue.



$$= \frac{\delta z}{\delta u}\frac{\delta u}{\delta y}$$

z = f(u,v) u = g(x,y) v = h(x,y)

Control Panel

Go to Quiz

Description: There is a tree diagram, illustrating the information flow of 3 functions.

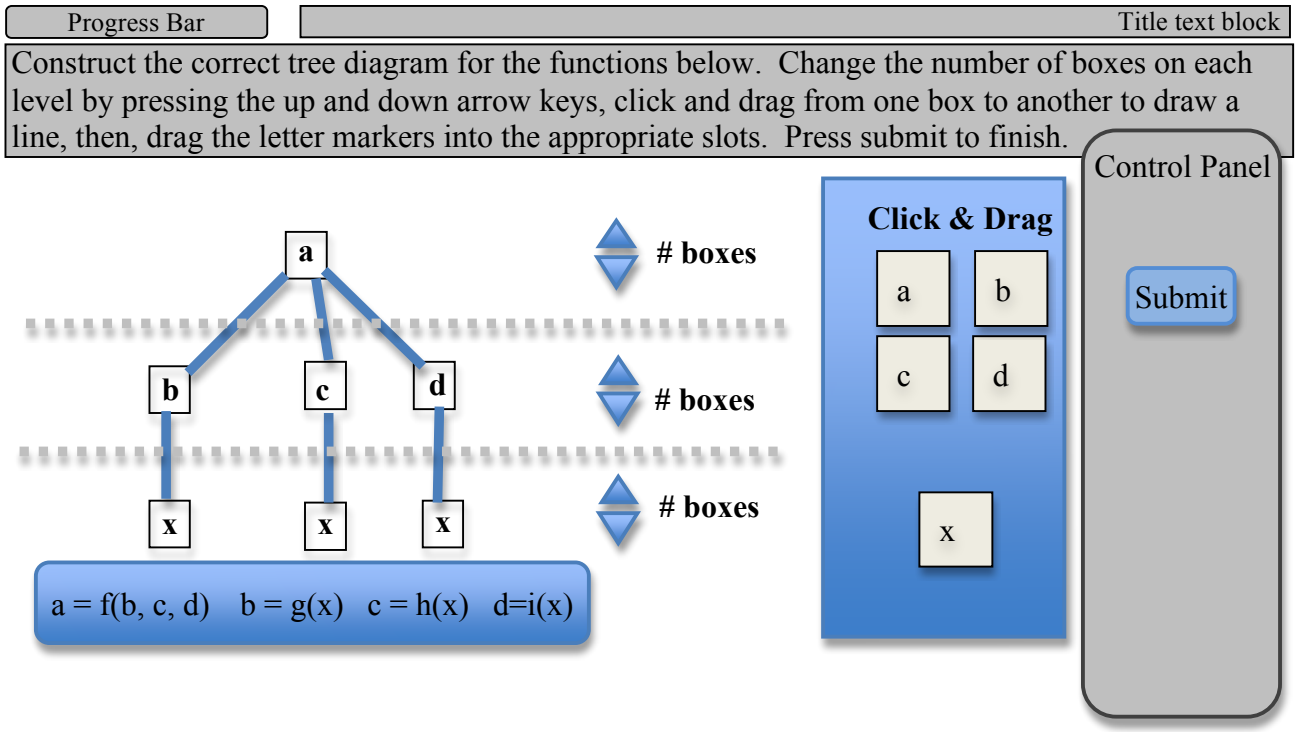
When the student hovers over a letter, it says "Click me" with the tool tip. When the student clicks on a letter, it highlights. If a student clicks an x or y, all the other x's & y's deselect. If the student clicks u, then the v deselects, and vise versa.

If the student has a letter from each level highlighted, it may show the partial derivative of that path in the box. If the letters make a line (as above), then the lines glow, and the partial derivative is shown for that branch. If the student chooses an x or y that is not in a straight path (eg. Z, u, right y. or z, v, left x) then no letters glow. The lines stop glowing if no straight branch is made. The glowing lines update when the branch path is changed. The student can click different letters at any time.

The path derivatives that show are: δz/δu δu/δx for the left branch, the derivative shown for the second branch, δz/δv δv/δx for the third branch, and δz/δv δv/δy **for the right most branch.**

The student can press go to quiz any time.

Question # 1 **out of** 2



Description: Above is the correct answer.

There is a box containing functions as shown. The student can increase and decrease the number of boxes using the up and down arrows. Pressing Up makes another box appear on the corresponding row. Pressing down makes a box disappear from the corresponding row. Number of boxes can range from 1 to 6.

From one existing box to another, the student can draw lines. They do this by clicking and dragging. When they click and drag, it draws a line, and ending the drag on another box makes the line snap to it.

The student must then put letters in the boxes, correctly. There are 8 boxes with letters on the left. When the student mouses over a letter, it says "drag me". When they click and drag a letter, then they pull a copy of the letter out. (they can drag multiples of each letter). If they end the drag on, or close to a box in the tree diagram, then the letter drops and snaps into that box. They are labelling the diagram.

The student is correct if they have A) the right number of boxes on each layer, B) the right lines drawn from box to box, and C) the right letters populating each box.
NOTE* for the second row, these populating letters can be in any order – bcd, cbd, dbc, etcetera.**

Correct answer Animation: A text box appears on the right side of the screen, such that the student can still see the tree diagram. One by one, the 3 branches light up, and their partial derivative component appears in the text box. Draw the partial derivative component so that it looks like the one in the pic of the explore mode. The components and branches are:

abx: [δa/δb db/dx], **acx: [**δa/δc dc/dx], **adx: [**δa/δd dd/dx]

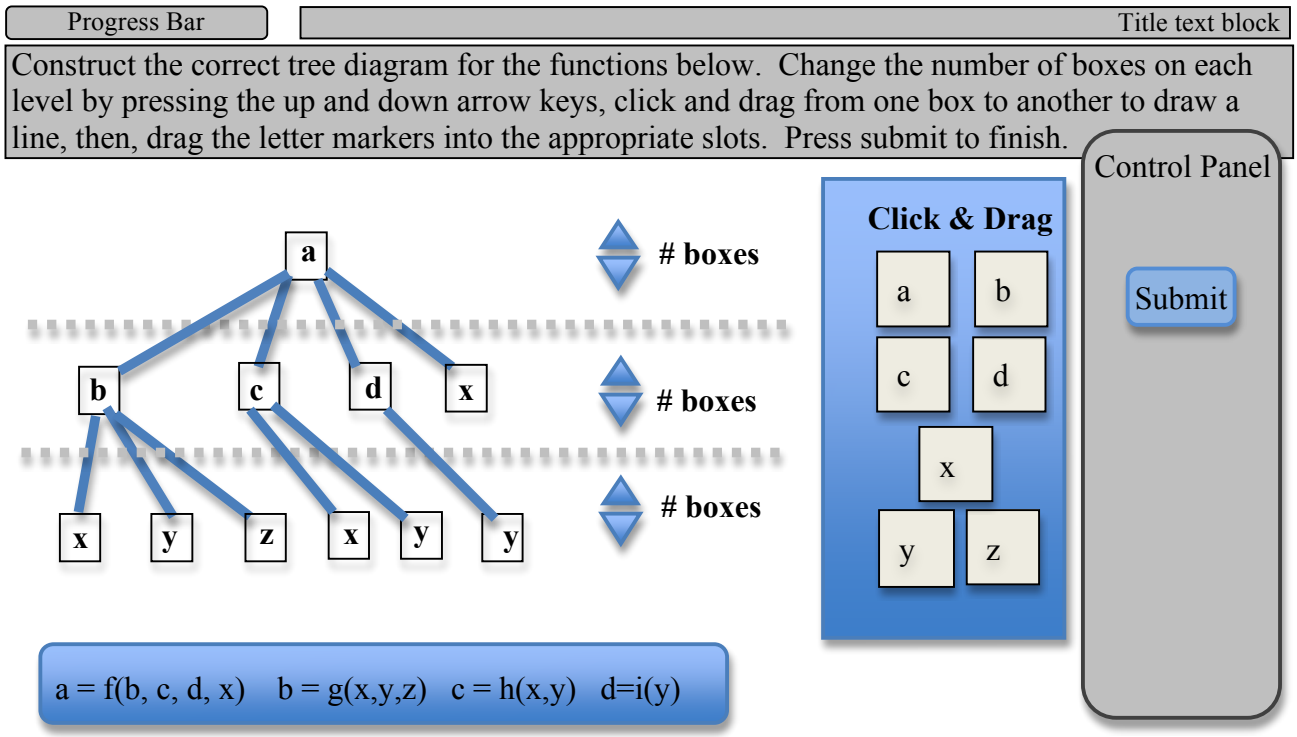
be sure to discriminate between δ's and d's in this part, as they are very different things.

Incorrect answer Animation: The student's tree diagram disappears and the correct tree diagram simply appears. Then the correct answer animation plays.

Incorrect submission hints: if the # of boxes is wrong in a tier or if a letter is incorrectly placed in a box, or if the box is empty, then the row flashes red. By row, I mean the boxes, and the space around the boxes. If the rows are all correct, then it checks if a line is incorrectly drawn. If any are incorrect, they flash red.

"Show Answer" animation: The student's tree diagram disappears and the correct tree diagram simply appears. Then the correct answer animation plays.

Question # 2 **out of** 2



Description: Above is the correct answer. [THIS QUESTION IS IDENTICAL IN FORM TO THE LAST QUESTION. Just change the details as shown.]

There is a box containing functions as shown. The student can increase and decrease the number of boxes using the up and down arrows. Pressing Up makes another box appear on the corresponding row. Pressing down makes a box disappear from the corresponding row. Number of boxes can range from 1 to 6

From one existing box to another, the student can draw lines. They do this by clicking and dragging. When they click and drag, it draws a line, and ending the drag on another box makes the line snap to it.

The student must then put letters in the boxes, correctly. There are 8 boxes with letters on the left. When the student mouses over a letter, it says "drag me". When they click and drag a letter, then they pull a copy of the letter out. (they can drag multiples of each letter). If they end the drag on, or close to a box in the tree diagram, then the letter drops and snaps into that box. They are labelling the diagram.

The student is correct if they have A) the right number of boxes on each layer, B) the right lines drawn from box to box, and C) the right letters populating each box.
NOTE* for the second row, these populating letters can be in any order – bcdx, cxbd, xdbc, etcetera. For the third row, it's trickier: the correct connections with the lines must be made. B must connect to x y & z (in some order), C must connect to x & y in some order, and D must connect to y.**

Correct answer Animation: A text box appears on the right side of the screen, such that the student can still see the tree diagram. One by one, the 3 branches light up, and their partial derivative component appears in the text box. Draw the partial derivative component so that it looks like the one in the pic of the explore mode. The components and branches are:

abx: [δa/δb δb/δx], **aby: [**δa/δb δb/δy], **abz: [**δa/δb δb/δz], **acx: [**δa/δc δc/δx], **acy: [**δa/δc δc/δy] , **ady: [**δa/δd dd/dy], **ax: [**δa/δx]

Take note that in the **ady** branch, it has d's instead of δ's in the second term

Incorrect answer Animation: The student's tree diagram disappears and the correct tree diagram simply appears. Then the correct answer animation plays.

Incorrect submission hints: if the # of boxes is wrong in a tier or if a letter is incorrectly placed in a box, or if the box is empty, then the row flashes red. By row, I mean the boxes, and the space around the boxes. If the rows are all correct, then it checks if a line is incorrectly drawn. If any are incorrect, they flash red.

"Show Answer" animation: The student's tree diagram disappears and the correct tree diagram simply appears. Then the correct answer animation plays.

Quality Checklist:

OS and Browser Compatibility:

OS System	Firefox	Chrome	Safari
Windows			
Mac OSX			
Linux (Ubuntu)			N/A

NOTE: All demos must display each question properly for each OS/Browser combination.

Server Compatibility:

Description:	Checklist
SWF can run as a standalone file off the server with no errors.	
While in offline mode the submit button uses server simulation	
While on the server the SWF can and transmit and receive data	

Demo Controls:

Description:	Checklist
User can traverse back and forward through questions without glitches	
User can reset at any time and question state will revert back to beginning state	
No cases of wrong answers marked as right	
No cases of right answers marked as wrong	
When the user presses the answer button the answer animation plays	
While an answer animation is playing the curtain is visible	
(Microstep) User can traverse back and forward through microsteps without glitches	
(Microstep) Reset sets the microstep back to 1 and reverts back to beginning state	
(Explore mode) The user can return to explore mode at any time	
(Explore mode) The user can return back to the last question from explore mode	

Miscellaneous Checks

Description:	Checklist
All interaction objects have the mouse cursor change to a hand while over object	
All fonts are Times New Roman, Helvetica or Futura	
Instructions text is appropriate **and written**.	
Demo title is appropriate **and written**.	