Guided Practice: Differentiation Rules (Ch 3.3)

OVERVIEW: So far, you have learned the limit definition of a derivative. Now we are going to use differentiation rules to directly take the derivative without having to use the limit.

LEARNING OBJECTIVES
Basic Objectives (to practice *before* class)
- State the Differentiation Rules
- Use the Differential Rules to find the derivative of functions

Advanced Objectives (to master during and after class)
- Using the product and quotient rules to find the derivatives of more difficult functions
- Apply derivatives to find the equation of a line tangent to a curve at a given point

RESOURCES FOR LEARNING
- Read Ch 3.3. As you read, study the rules and examples. (15 min)
- As you read, write the following rules in your notebook: (5 min)
    - Derivative of a Constant Function
    - Derivative of a Positive Integer Power
    - The General Power Rule
    - Derivative of a Constant Multiple
    - Derivative Sum Rule
    - Derivative of the Natural Exponential Function
    - Derivative Product Rule
    - Derivative Quotient Rule
- Watch these videos and take notes:
    - https://www.youtube.com/watch?v=rRphiUtRKcY (10 min), basic rules
    - https://www.youtube.com/watch?v=W233qRK6HPs (5 min), negative powers
    - https://www.youtube.com/watch?v=esxNDR1epeo (10 min), product and quotient rules
- On MyMathLab, do Ch 3.3 Pre-Work Problems (7 total). In your notebook, work out the exercise problems neatly and box your answers. MML Pre-work is due one hour before class. Use the Question Help button when needed. (25 min)

For class:
Bring your notebook to help you with the class activity. I will check your notebooks for participation points. Bring in any questions you may have.

Commented [DM1]: Added in since I will be checking notebooks now and it make them accountable for pre-work

Commented [DM2]: Added so that they take the work shown seriously and so that they can use the notebook during class

Commented [DM3]: Added so they know why they need to be doing the pre-work and give value to what they are doing

Lesson Plan Ch 3.3 (65 min class)

Announcements (2 minutes)

Review of Pre-Work:

- Answer any questions about the pre-work (8 minutes)

Main Activity:

- Objectives (1 min)
    - Use the product and quotient rules to find the derivatives of more difficult functions
    - Apply derivatives to find the equation of line tangent to a curve at a given point
- Short Lecture (9 minutes)
    - Remember that a derivative represents the slope of the tangent line of a function $y = f(x)$ at $x = x_0$
    - What is the point-slope form of a line? $y - y_0 = m(x - x_0)$
    - What the slope-intercept form of a line? $y = mx + b$
    - So if you take the derivative of a curve and plug in a specific value for the independent variable, you are finding the slope of the line tangent to the curve at the point. And then you can use the slope and the point to find the equation of the line tangent to the curve at that point.
- Divide and conquer (28 minutes):
    - Hand out a notecard to each student. Either the notecards are 6 different colors, or the notecards are numbered 1 to 8, or some other fun way to group them). Purple are one group, red are one group, etc. Or 1's are one group, 2's are one group, etc.
    - Each group is assigned a problem. Pick a representative to be the one to ask me questions or verify their answers. When done with their problem, work on the other problems assigned to the other groups.

Group designates someone to present their group's assigned problem on the board later. Remind them that they have to present 3 or 4 times in a semester for participation points.

- Groups on left side of the room:

58. Find the tangent line to the *Witch of Agnesi* (graphed here) at the point (2, 1).

$$y = \frac{8}{x^2 + 4}$$

(2, 1)
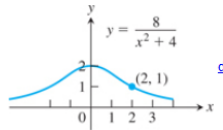
- Groups in middle of the room:

Find the first derivative of $y = (1 + x^2)(x^{\frac{3}{4}} - x^{-3})$ using the product rule

- Groups on right side of the room:

Find the first derivative of $y = \frac{x^2 + 3e^x}{2e^x - x}$

- As they work, instructor walks around to check their notes and record their grade (participation points). Also, to facilitate activity.

- Group representatives present problems on board (participation points) while others correct their work and ask questions (15 minutes)

Post-Work reminder: (2 min)

- Finish Ch 3.3 Pre-Work for partial credit by tonight, midnight.
- Do Ch 3.3 Post-Work (5 problems total) on MyMathLab, due tomorrow at midnight. Use the Question Help button when needed. (25 minutes)
- Start Ch 3.4 Pre-Work, due 1 hour before next class. See Ch 3.4 Guided Practice on Blackboard.