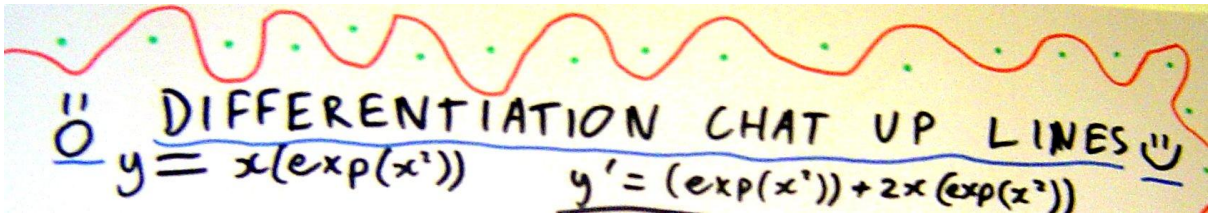
Risp 38: Teacher Notes

Suggested Use: to consolidate/revise

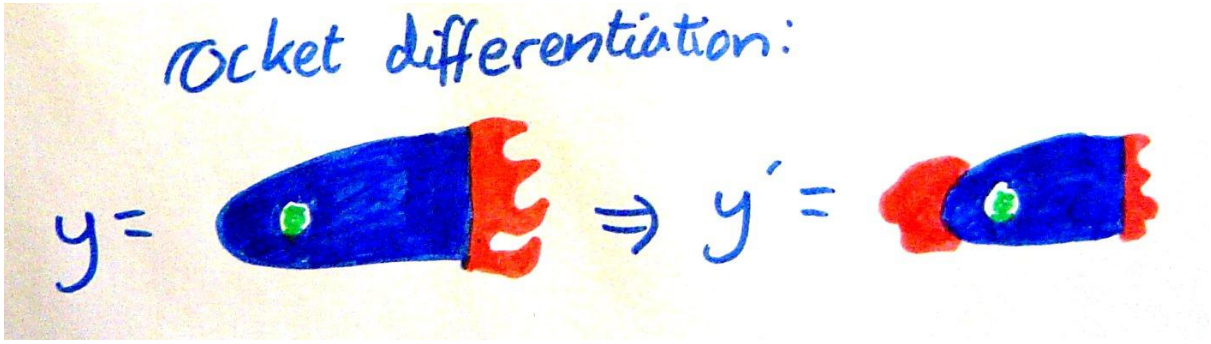
Product, Quotient, Chain Rules for Differentiation

This is an excellent activity for poster work. Last year, one group's poster started like this:



This was my fault. I often end some exposition on a dryish topic by saying, "You may not realize it, but as a result of this lesson, you're a lot better off. If someone now comes up to you at a party and says, "I'm looking for some who can differentiate xlnx, is there any chance you can help?", you'll be able to say, "Well, actually, yes I can, shall we look at this over a drink?" " My facetious comments tend to get the posters they deserve.

Another poster contained a mistake. Thick felt pen is not easily erased. The solution? Of course - turn the mistake into a rocket. "Mmm – how do you differentiate a rocket?" I mused while passing by. When I wandered back a few minutes later, there was the answer:



"To differentiate a rocket, bring the fire down and reduce the fire by one." Obvious when you think about it.

Risp 38 invites students to try out their understanding of the Product Rule, The Quotient Rule, and the Chain Rule. In other words, how do you differentiate functions bracketed like this: ()() or like this: ()/() or like this (()). It is possible to create 10 equations that make sense.

1. $y = (x^2)(\exp x)$	*[Product Rule needed]*
2. $y = \exp((x^2)x)$	*[Chain Rule needed]*
3. $y = (x\exp(x^2))$	*[Product Rule, Chain Rule needed]*
4. $(x^2)y = \exp(x)$	*[Quotient Rule needed]*
5. $(x)y = \exp(x^2)$	*[Quotient Rule needed]*
6. $\exp(x^2)y = (x)$	*[Quotient Rule, Chain Rule needed]*
7. $(\exp x)y = (x^2)$	*[Quotient Rule needed]*
8. $\exp y = ((x^2)x)$	*[Differentiation of ln needed]*
9. $(x^2)\exp y = (x)$	*[Differentiation of ln needed]*
10. $(x)\exp y = (x^2)$	*[Differentiation of ln needed]*

The corresponding expressions for y' are:

1. $y' = x^2e^x + 2xe^x$	*[y'(1) = 3e]*
2. $y' = 3x^2e^{x^3}$	*[y'(1) = 3e]*
3. $y' = e^{x^2} + 2x^2e^{x^2}$	*[y'(1) = 3e]*
4. $y' = (x^2e^x - 2xe^x)/x^2$	*[y'(1) = -e]*
5. $y' = (2x^2e^{x^2} - e^{x^2})/x^2$	*[y'(1) = e]*
6. $y' = (1 - 2x^2)/e^{x^2}$	*[y'(1) = -1/e]*
7. $y' = (2xe^x - x^2e^x)/e^{2x}$	*[y'(1) = 1/e]*
8. $y' = 3/x$	*[y'(1) = 3]*
9. $y' = -1/x$	*[y'(1) = -1]*
10. $y' = 1/x$	*[y'(1) = 1]*

Thus there are 8 different values for y'(1) to be found.

Can anybody collect the whole set?

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