Slippery slopes... another derivative

Teacher notes

Why use this resource?

This resource could be used before introducing chain rule formally to encourage students to realize the effectively discover chain rule for themselves. In this resource students can explore how the derivatives of functions like $\frac{1}{2x+1}$ can be obtained by viewing them as translations of functions that we already know how to differentiate.

Preparation

Depending on the approach taken access to devices running GeoGebra or with web access might be helpful. If devices are not accessing the web the GeoGebra file would need to be available on each device.

Possible approaches

If individual or group devices available:

- In pairs or small groups Students investigate the movement of point A and the two tangents and think about answers to questions (1) and (2). Possibly in a think, pair, share format.
- Ideas are pooled and ideas tested for answering question (3), students could check their ideas by adapting the GeoGebra file to a different function and checking their rule still works. They could also access the suggestions on the site.

Using a class-displayed GeoGebra file only:

- Display the page (in fullscreen mode) and invite a student to move point A around and ask students to think about how they could answer question (1).
- Ask students to write their idea and if they have calculated it their answer onto a mini white board.
- Have students show their white boards and discuss in small groups their strategies and come up with ideas to answer (2).
- Plenary ideas from the groups and ask if they believe their "rule" will work for $\frac{1}{2x+1}$. This can then be tested using the GeoGebra aplet on the solution tab.

Key questions

- Does your rule work for a denominator of $(x+3)$ or $x-2$?
- What happens if you apply your rule to $\frac{1}{2x+1}$?
- Can you transform a simpler function (that you can differentiate) into this? What function and what transformation?
- What about other linear denominators such as $3x-2, 2x-3$ etc.?
- Can you generalise these results?

Possible support

- How do the tangents at A and B compare?
- What are the coordinates of B?
- How can we find the gradient at B? What is it?

Possible extension

- What about other denominators: $x^2+1, : 2x^2-1$?
- Can you generalise your results?