

NCEA Level 2 Mathematics (Homework)

11. Slopes and Differentiation

Reading

Go and watch...

<https://www.youtube.com/watch?v=axZTv5YJssA>

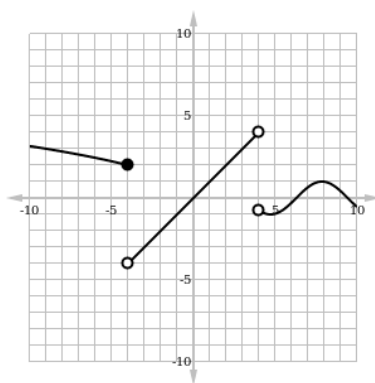
What's it good for?

People use calculus for...

- Engineering and physics: calculus is the natural language of any system which moves or changes over time (the movement of a vehicle or a robot arm, or the current in an electrical system).
- Chemistry and biology: rates of reaction and fluid pressure, population growth, and molecular kinetics are all examples of systems that are best understood using either calculus or further applications of calculus.
- Mathematics: the subjects which grow out of calculus (analysis and topology, for example) are fundamental geometric theories of space, distance, and transformation.

Questions

1. A function f is given by $f(x) = 2x^3 - 10x + 5$. Find the gradient of the graph of f at the point where $x = 2$.
2. Find the coordinates of the point on the curve $y = \frac{4}{x^2}$ where the gradient is 1.
3. Answer the following questions about this graph. Open circles denote locations where the function *is not* defined, while filled circles denote locations at the end of a segment where the function *is* defined.



- (a) What is the slope of the graph at $x = 8$?
- (b) Does the function have a derivative everywhere (i.e. can you guess the slope of the graph at every point)? If not, where does it fail to be differentiable?
- (c) At $x = -5$, is the derivative positive or negative?
- (d) What is the slope of the curve around $x = 0$?