Gradient match

Teacher notes

Why use this resource?

A resource to get students thinking about the graphical links between a function and its gradient.

Preparation

Cards need printing, cutting and sorting. Depending on what has previously been taught a warm-up activity might be needed.

Possible approaches

Potentially a white board exercise as warm-up sketching the gradient function of a graph displayed on the board or a printed graph for students to sketch the gradient below on a separate set of axes. Encourage students to consider stationary points of the initial function and where the graph is increasing/decreasing.

Students work in pairs or 3s to match the cards into two columns, function and gradient. As Pairs finish they can compare their results with another group who has finished. If they don't agree they should hammer out between them which group was right and why.

Students work in 3s to match the cards. If they are convinced of their answer a runner comes to fill in a chart on the board. Discrepancies can then be discussed in larger groups or whole class context.

Key questions

- Does it matter which way round the pair go? (Many students may incorrectly believe the trig pair doesn't matter.)
- What features will help you match them?
- What does a stationary point on a gradient function tell you about the function?

Possible support

Prompting questions such as:

- What feature of the gradient function will match a stationary point of a function?
- What would the gradient function be doing here..., or here...?
- If this is the gradient function what will the function be doing here...or here...?

Walk sorting is a more concrete version including thinking about the real life situations that are being graphed.

Possible extensions

Sketch the gradient functions of the cards you have selected as gradients. (See resource Gradients of gradients.) Sketch functions which your function graphs would be gradient functions of.

The graphs on the Gradient match cards can be used in a number of ways in addition to the way suggested in this problem. In particular, they provide a set of shared examples to support a number of classroom activities. Here are some other potential uses of the graphs.

Behaviour of functions

- Describing functions using vocabulary such as one-to-one and many-to-one, increasing, decreasing, maxima, minima, points of inflection, asymptotes, convexity.
- Sketching inverse functions and restricting the domain.
- Visualising the manipulation of inequalities – on which intervals are inequalities preserved or reversed?

Alternative card sorts

- How can you classify the curves? Students decide which features of the graphs they will use to classify the graphs. How are they the same and how are they different? Students could be asked to provide further examples or non-examples for each of their groups (by combining transformations of specific standard functions or by sketching graphs.) See the resource Choose your families.
- Integral matcher

Curve fitting

- Recreating the shape of these graphs from knowledge of standard functions, either by sketching or using Desmos. This might be a practical way to introduce piecewise functions.
- Insert graphs as background images in GeoGebra and try to fit functions to them.

Area under curve

- How can you estimate and improve estimates for area under a curve, for example, by using the trapezium rule? Which graphs will give you an underestimate or an overestimate? The investigation resource Underneath the arches explores this.