

# Congratulations! You passed!

Grade received 100%

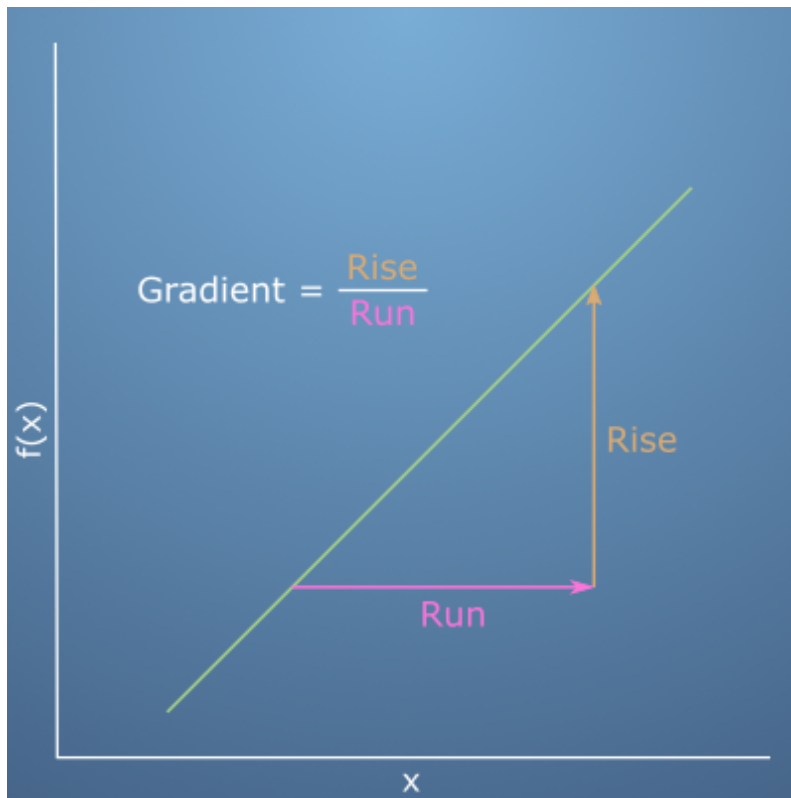
To pass 80% or higher

**Go to next  
item**

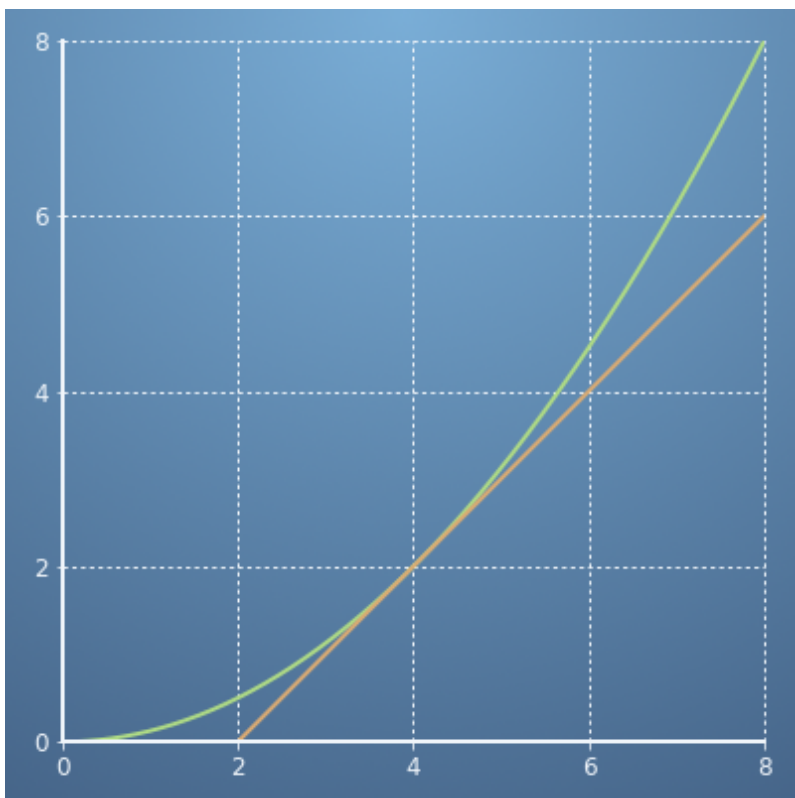
1. In this quiz you will practice estimating the derivative of a function by choosing the most suitable graphs.

**1 / 1 point**

We can calculate the gradient of a straight line by looking at how much the function  $f(x)$  changes, divided by the the amount the variable  $x$  changes. This is sometimes called "rise over run", as illustrated in the following image:



Use this information to estimate the gradient of the tangent to the non-linear, green function at the point  $(4, 2)$  based on the image below. (NB. the tangent line at the point  $(4, 2)$  is drawn on in orange to help you do this calculation.)



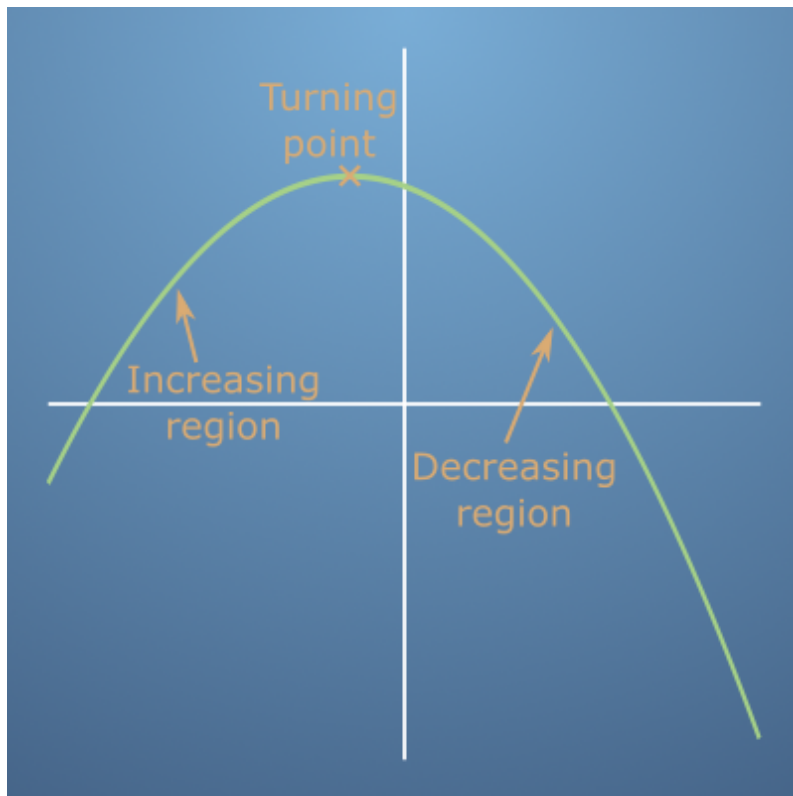
- ☐ The gradient is -1.
- ☐ The gradient is 0.
- ☒ The gradient is 1.
- ☐ The gradient is 2.

**Correct**

Change in  $y$  divided by the change in  $x$  gives the gradient of a straight line (the tangent).

2. It's possible to have a reasonable guess at what the derivative of a function will look like by considering regions of the function with different gradients. Let's look at the following image as an example:

**1 / 1 point**

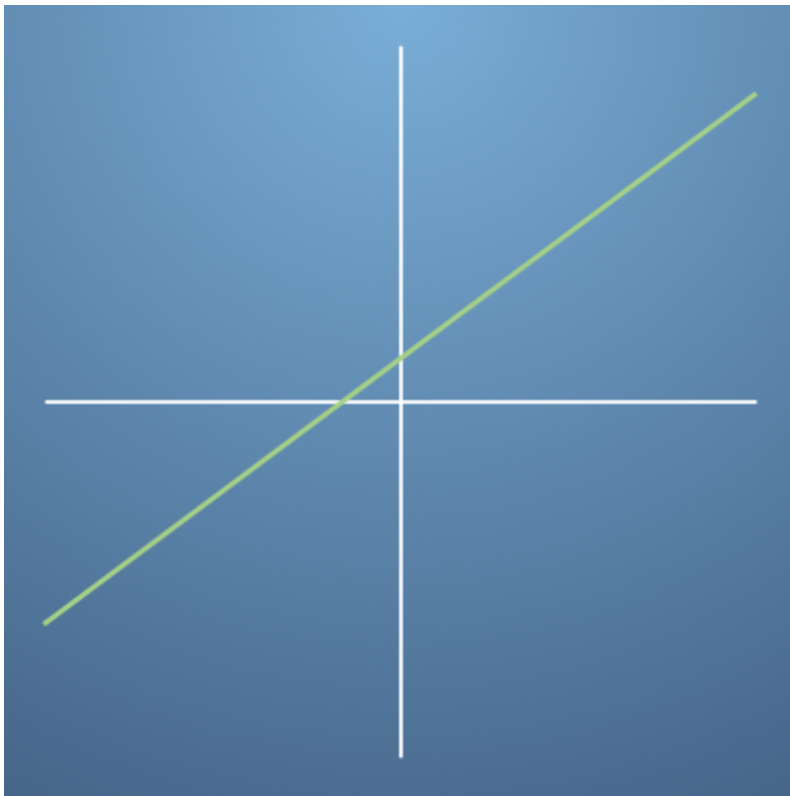
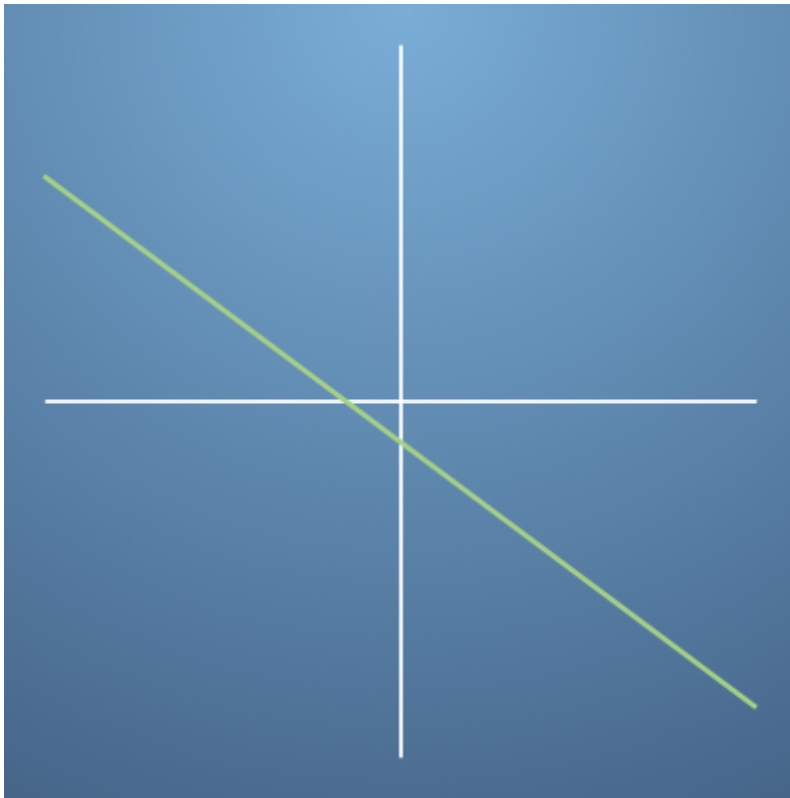


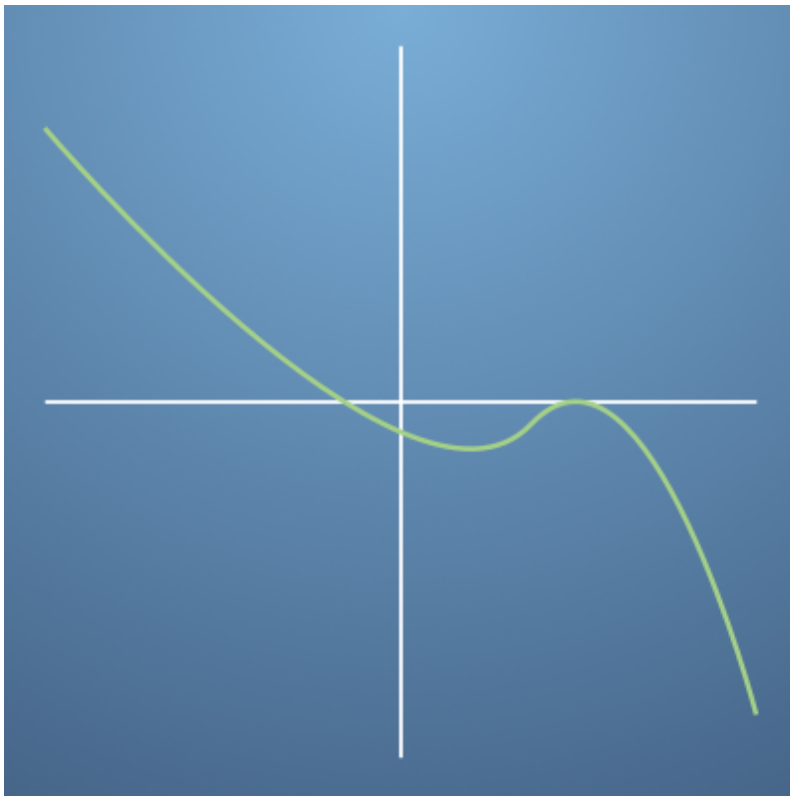
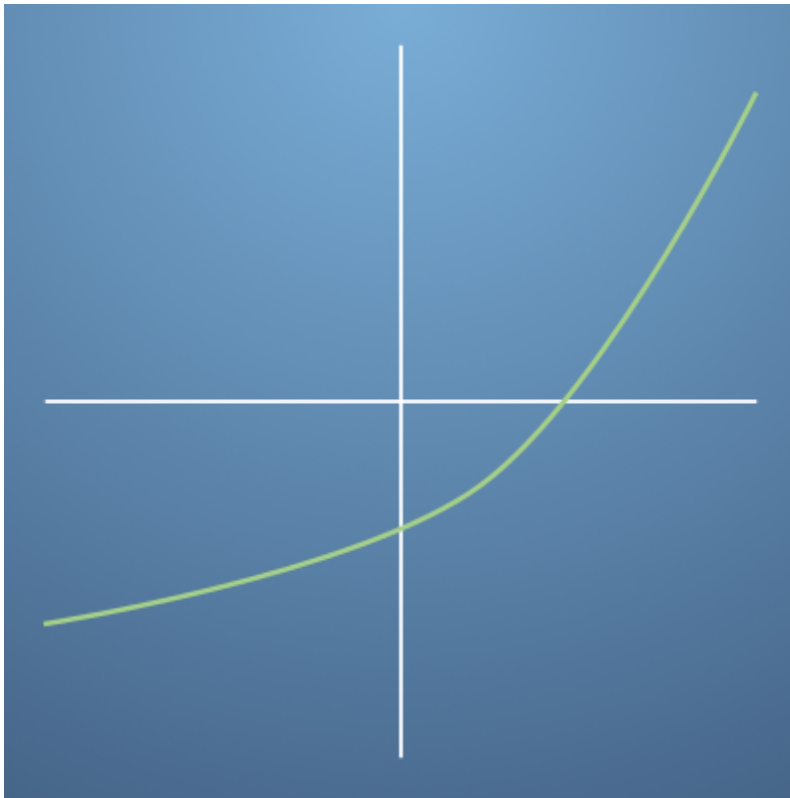
We can see that there are three types of behaviour we might see in the gradient of a smooth function. On the left there is a region where the function is increasing, and therefore has a positive gradient, which is the same as saying it has a positive derivative.

On the right there is a region where the function is decreasing, so the gradient and derivative would be negative.

In between there is a turning point, where the gradient is exactly 0 at a specific value of  $x$ . Here the derivative will pass through 0 as it moves from positive on the left to negative on the right.

Using this information, which plot could show the derivative of the above function? Assume the  $x$ -axis is over the same range.

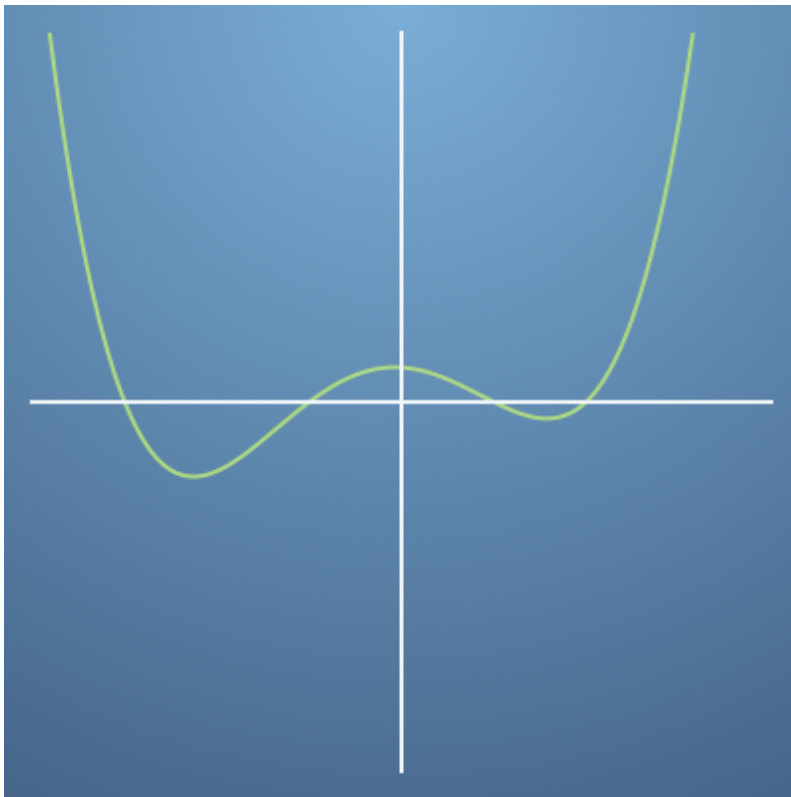


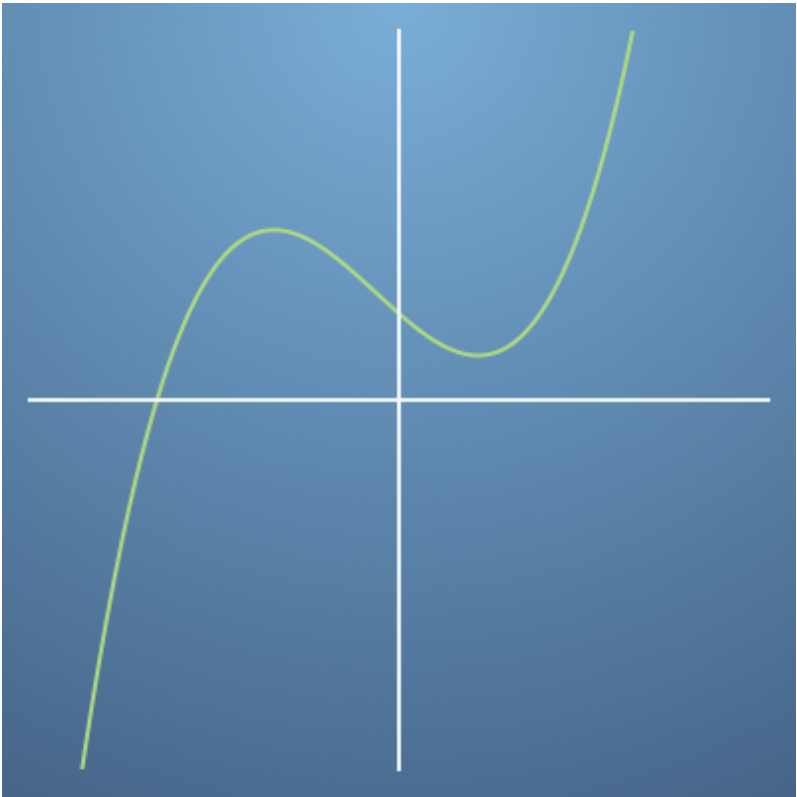


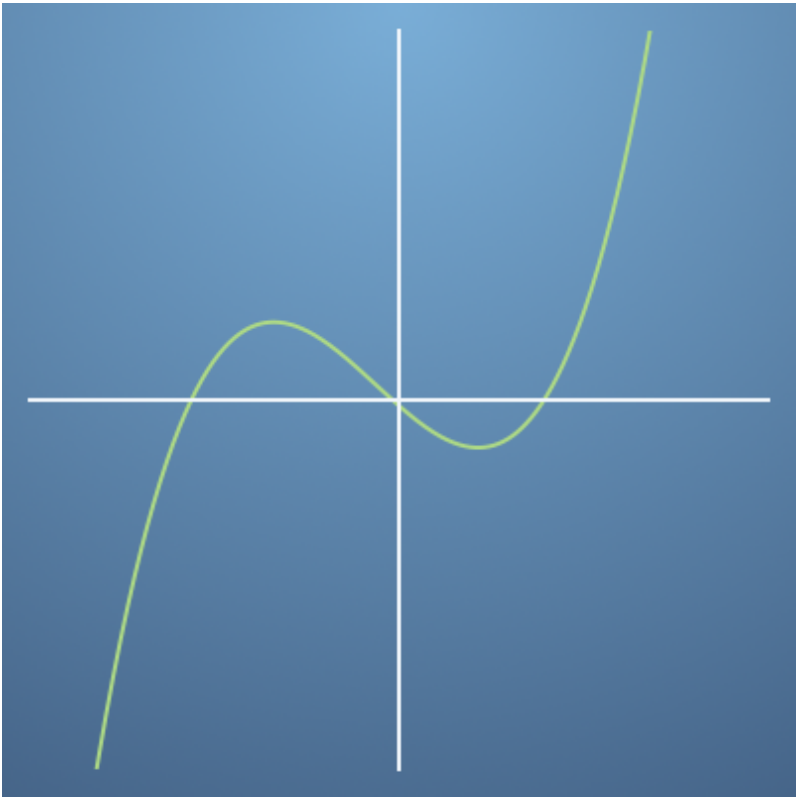
**Correct**

The derivative starts positive in the "increasing region" and becomes negative in the "decreasing region", passing through zero at the "turning point"

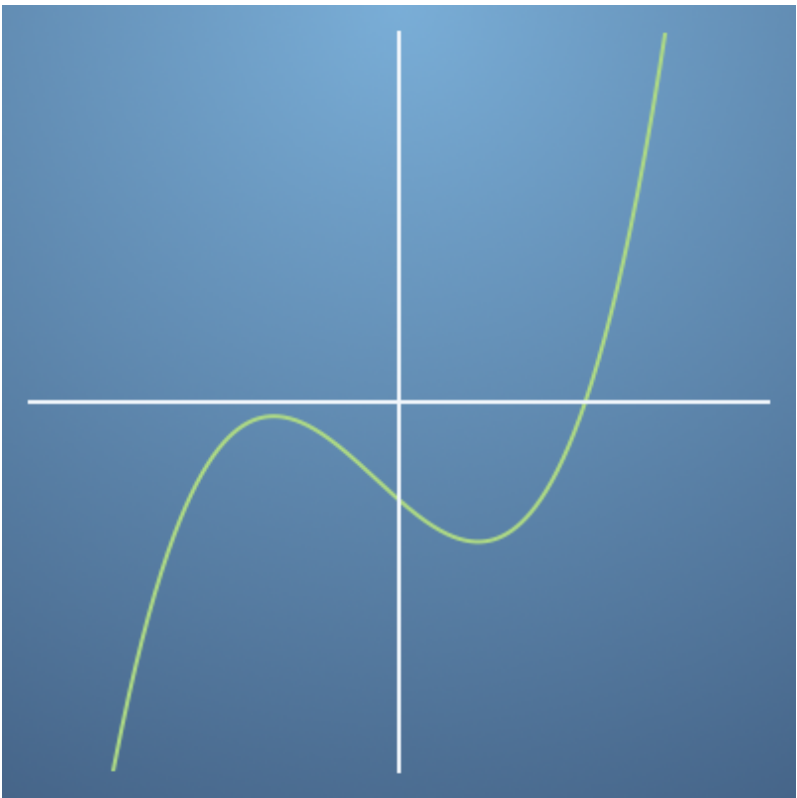
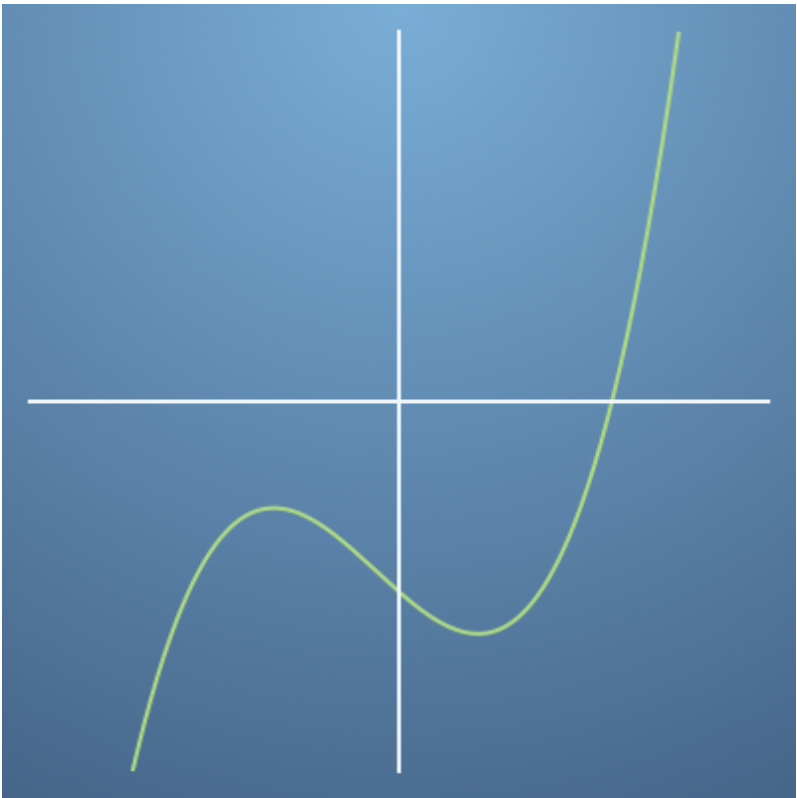
3. Use the same method of breaking up the plot into increasing and decreasing regions and points with zero gradient to identify which diagram below best describes the derivative of the function in the following graph. (Hint: start by counting how many times the gradient is zero.)

**1 / 1 point**





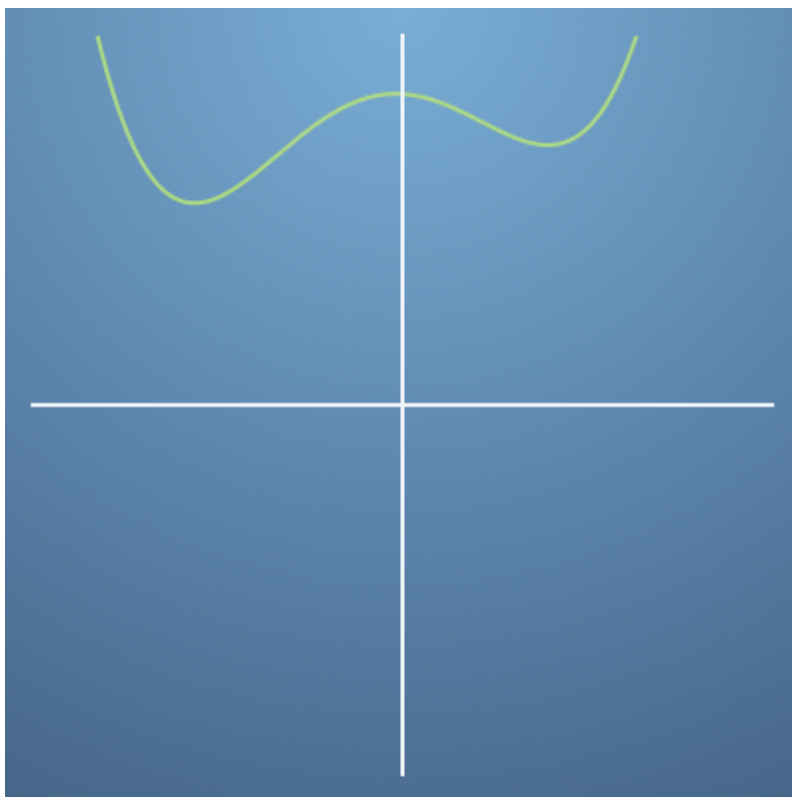


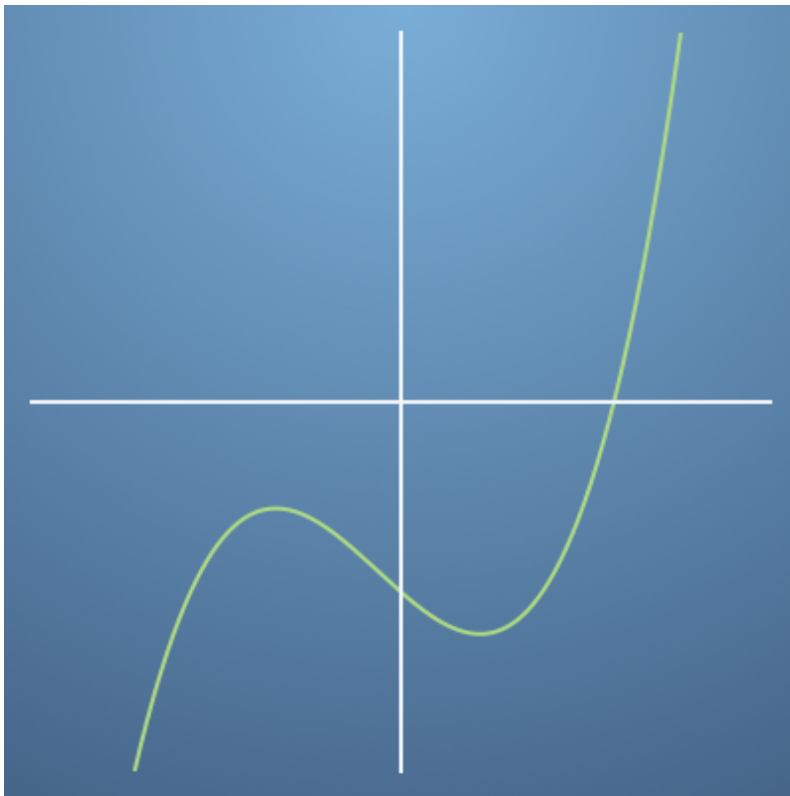
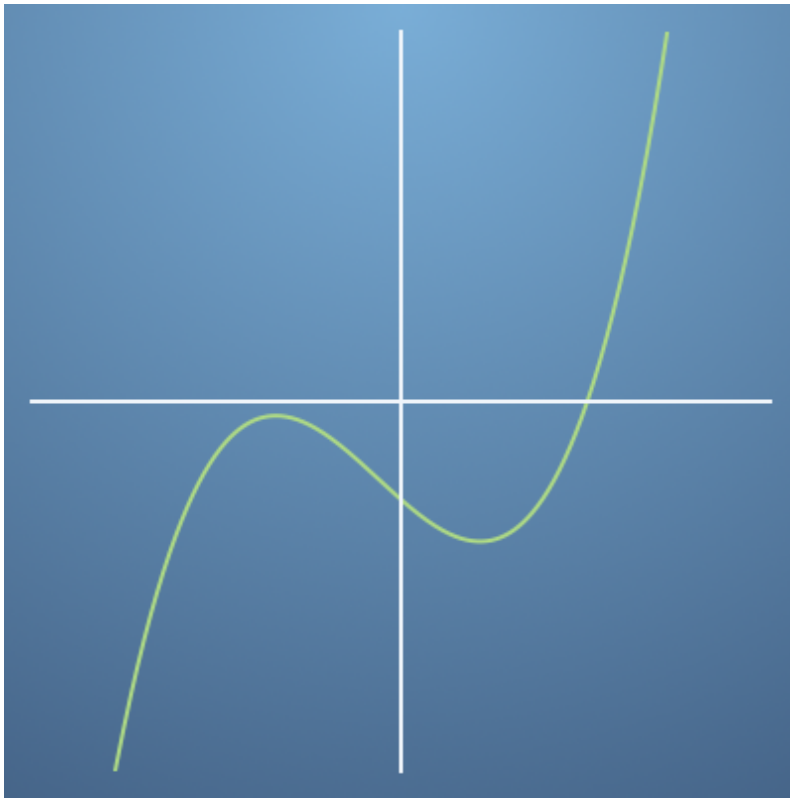


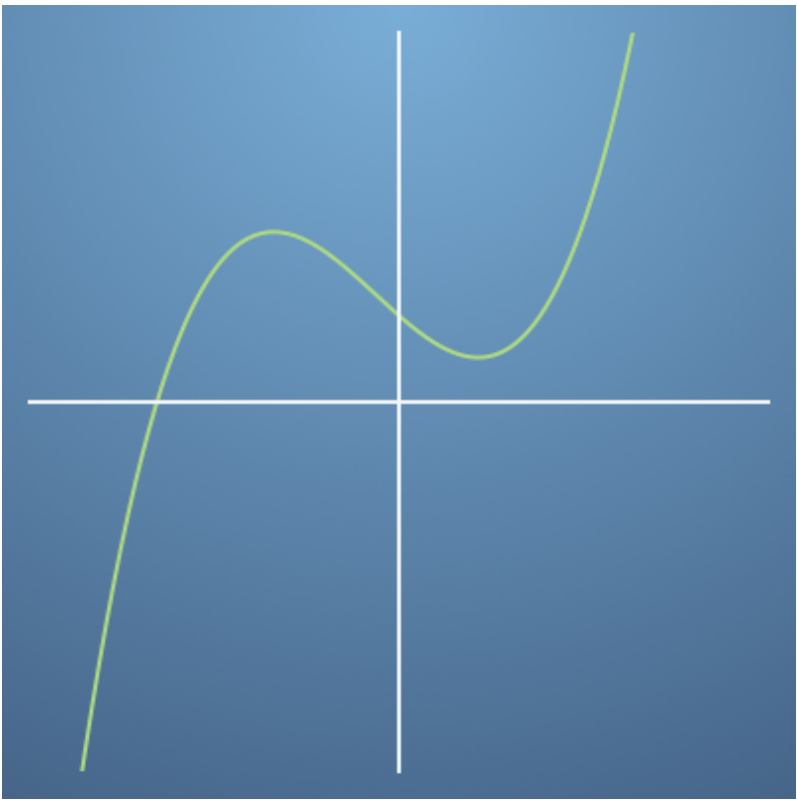
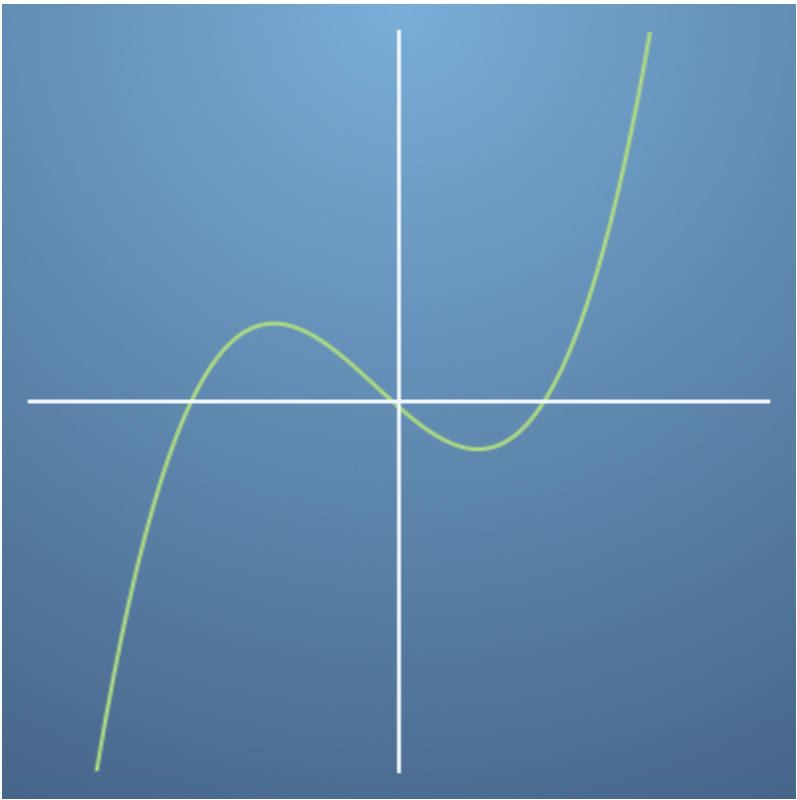
**Correct**

This figure best describes how the function changes with  $x$ .

4. Which diagram best describes the derivative of the function in the following diagram?  
(Hint: This function is just the same as the previous question, but shift upwards... will this affect the gradient?)

**1 / 1 point**

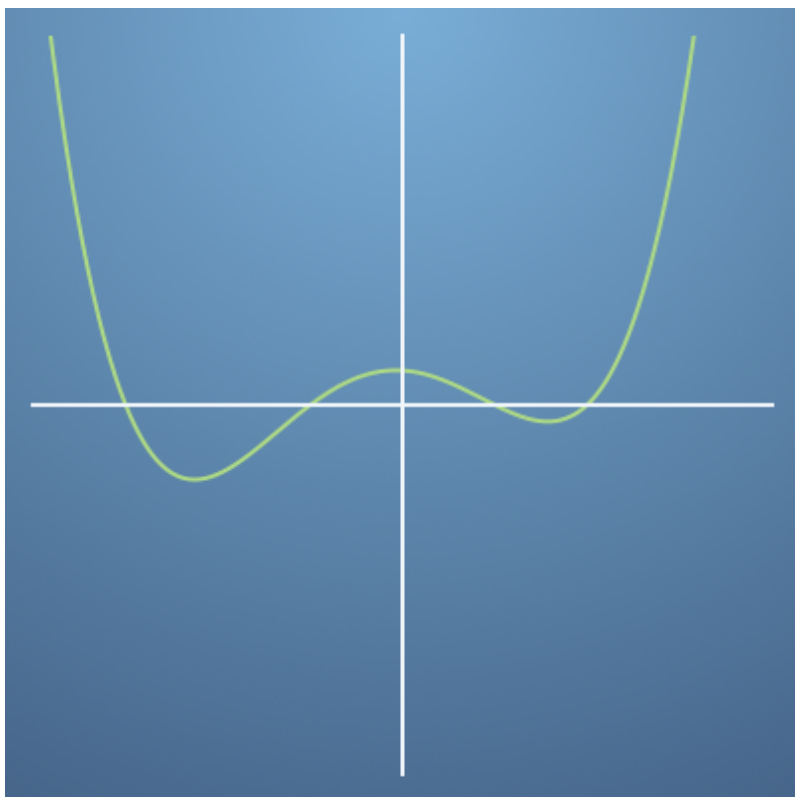




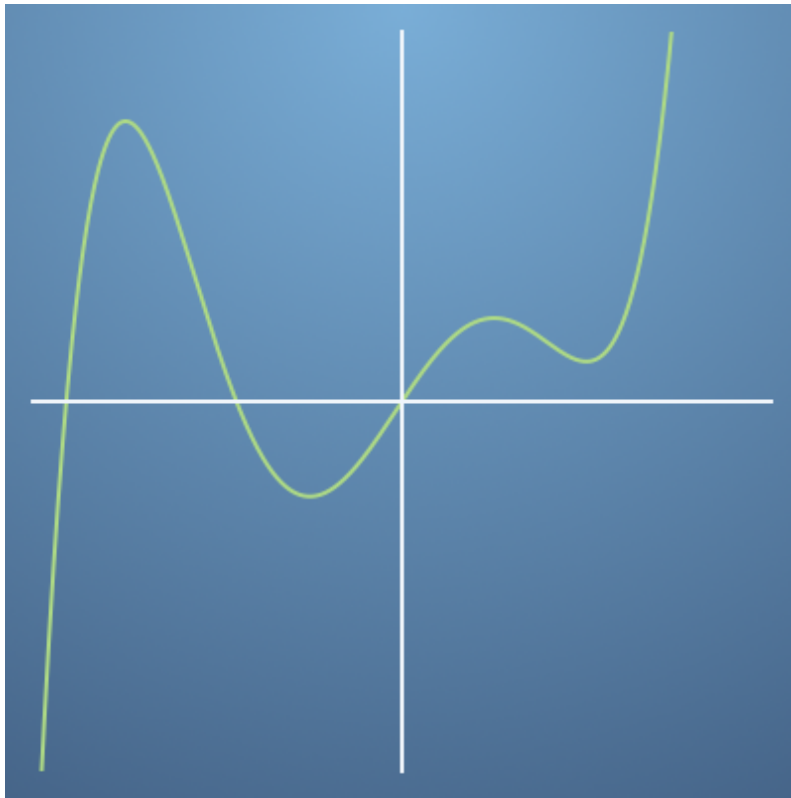
**Correct**

Shifting a function up or down does not change the gradient at all.

5. Now for the reverse problem... Look at the figure below.

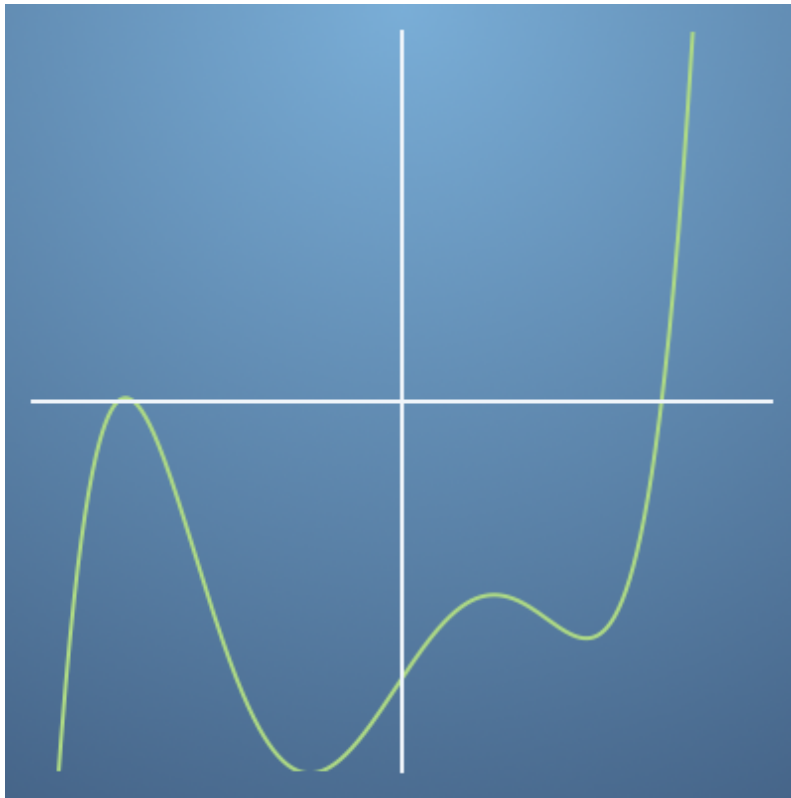
**1 / 1 point**

Which of the following diagram(s) could the above plot be the **derivative** of? Choose **all** correct answers. (Hint 1: How many times is the curve above equal to zero (i.e. crosses the horizontal axis). Hint 2: There are two graphs below that could both equally be correct, so select them both!)?



**Correct**

Well done! If one function is a vertical shift of another function, then they have the same differential.



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