**What is GitOps?**

GitOps is an operational framework that takes DevOps best practices used for application development such as version control, collaboration, compliance, and CI/CD tooling, and applies them to infrastructure automation. While the software development lifecycle has been automated, infrastructure has remained a largely manual process that requires specialized teams. With the demands made on today’s infrastructure, it has become increasingly crucial to implement infrastructure automation. Modern infrastructure needs to be elastic so that it can effectively manage cloud resources that are needed for continuous deployments.

Modern applications are developed with speed and scale in mind. Organizations with a mature DevOps culture can deploy code to production hundreds of times per day. DevOps teams can accomplish this through development best practices such as version control, code review, and CI/CD pipelines that automate testing and deployments.

GitOps is used to automate the process of provisioning infrastructure. Similar to how teams use application source code, operations teams that adopt GitOps use configuration files stored as code (infrastructure as code). GitOps configuration files generate the same infrastructure environment every time it’s deployed, just as application source code generates the same application binaries every time it’s built.

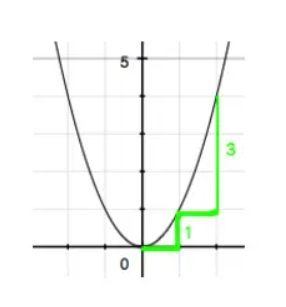
**Derivative and Slope: What’s the difference?**

**A derivative of a function** is a representation of the rate of change of one variable in relation to another at a given point on a function.

**The slope** describes the steepness of a line as a relationship between the change in y-values for a change in the x-values.

Clearly, very similar ideas. But let’s look at the important differences. A function’s derivative is a function in and of itself. It may be a constant (this will happen if our function is linear) but it may very well change between values of x.

Let f(x) = x2.  Our derivative f’(x) = 2x.  If we take a look at the graph of x2, we can see that for each step we take along the curve, the value of y changes more and more.  Between x = 0 and x = 1, y only increases by 1.  But between x = 1 and x = 2, y increases by 3.  If we keep going with this trend, between x = 2 and x = 3, y changes by 5.  We don’t have a constant change between equally spaced values of x, but rather y changes by twice as much each step.



A slope has the same idea, but can only be used for a line.  The slope of a line tells us how much that line’s y value changes for any given change in x, but we do not use this term for curves or non-linear functions as by definition, our slope is constant: A line always has the same slope.  Every step we take along the x-axis, the change in our value of y remains constant.  A positive slope indicates that y increases as x increases.   A negative slope implies that y decreases as x increases.  And a 0 slope implies that y is constant.  We cannot have the slope of a vertical line (as x would never change).

A function does not have a general slope, but rather the slope of a tangent line at any point.  In our above example, since the derivative (2x) is not constant, this tangent line increases the slope as we walk along the x-axis.

We cannot have a slope of y = x2 at x = 2, but what we can have is the slope of the line tangent to this point, which has a slope of 4.

We can also take multiple derivatives, each gives us a new piece of information about our curve.  If the derivative of a function tells us how one variable changes with respect to another, the derivative of the derivative (named the second derivative or double derivative) tells us how about the change in the change of one variable with respect to another.  If we take the example above **y = x2**, the derivative **y’ = 2x** shows us that the slope of a tangent line is constantly increasing.  The second derivative **y’’ = 2** tells us that the change in this change is constant.

This is easier to see in a physical representation.  Let us give the position of a function as x(t) = 3t2-2t+1.  We can see that the position is not linear.  The derivative of this function x’(t) = 6t -2 gives us our velocity at any give time.  Our velocity we can see is also itself changing with time.  If we take our second derivative x’’(t) = 6 shows us how our velocity is changing with time.  This is named our acceleration, which in our above example is constant.

It is important to remember how to use the derivative to find the slope of a tangent line, but remember that the derivative itself is not a slope in and of itself.  The derivative is a powerful idea that use used in many different ways.