General Principles

We can either describe the graph itself OR the gradient of the graph.

For the former, we need to describe

- (a) If the graph is *increasing/decreasing/constant* and
- (b) If the gradient is *increasing/decreasing/constant* and
- (c) The direction (**positive/negative**), if necessary

Using the displacement-time graph as an example, we have the following description:

The displacement of the object is increasing (because the magnitude is getting larger) at an increasing rate (because the gradient is getting steeper).

Hence, our answer is as follows:

The displacement of the object is increasing at an increasing rate.

For the latter description using the gradient, we need to know:

- (a) The **physical quantity** that the gradient represents and
- (b) Whether the gradient is **constant/getting steeper/gentler**
- (c) Whether the gradient is **positive or negative**

Using the displacement-time graph as an example, we have the following description:

The velocity (as gradient of displacement-time graph is velocity) is increasing (as the gradient is getting steeper) and positive (as the gradient is positive).

Hence, our answer is as follows: *The velocity is increasing and positive.*

(Note the underlined part for both description. Can you see the link between the two?)



Application of General Principles

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
	s/m	v / m s ⁻¹	a / m s ⁻²
	t/s	t/s	t/s
Graph	Object is at rest	The velocity of the object is constant	The acceleration of the object is constant
Gradient	The velocity is zero	The acceleration is zero	

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
	s/m ♠	v/m s ⁻¹	a / m s ⁻²
	t/s	t/s	t/s
Graph	The displacement of the object is increasing at a <u>constant</u> rate	The velocity of the object is increasing at a <u>constant</u> rate	The acceleration of the object is increasing at a constant rate
Gradient	The velocity is <u>constant</u> and positive.	The acceleration is <u>constant</u> and positive.	

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
	s/m t/s	v/m s ⁻¹	a/m s ⁻²
Graph	The displacement of the object is increasing at an <u>increasing</u> rate	The velocity of the object is increasing at an <u>increasing</u> rate	The acceleration of the object is increasing at an increasing rate
Gradient	The velocity is <u>increasing</u> and positive.	The acceleration is <u>increasing</u> and positive.	

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
	s/m t/s	v/m s ⁻¹	a/m s ⁻²
Graph	The displacement of the object is increasing at a <u>decreasing</u> rate	The velocity of the object is increasing at a <u>decreasing</u> rate	The acceleration of the object is increasing at a decreasing rate
Gradient	The velocity is <u>decreasing</u> and positive.	The acceleration is <u>decreasing</u> and positive.	

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
Graph	s/m t/s	v/m s ⁻¹	a/m s ⁻²
Displacement	The displacement of the object is decreasing at a <u>constant</u> rate	The velocity of the object is decreasing at a <u>constant</u> rate	The acceleration of the object is decreasing at a constant rate
Gradient	The velocity is <u>constant</u> and negative.	The acceleration is <u>constant</u> and negative.	

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
Graph	s/m t/s	v/m s ⁻¹	a/m s ⁻²
Displacement	The displacement of the object is decreasing at an <u>increasing</u> rate	The velocity of the object is decreasing at an <u>increasing</u> rate	The acceleration of the object is decreasing at an increasing rate
Gradient	The velocity is <u>increasing</u> and negative.	The acceleration is <u>increasing</u> and negative.	

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
Graph	s/m t/s	v/m s ⁻¹	a/m s ⁻²
Displacement	The displacement of the object is decreasing at a <u>decreasing</u> rate	The velocity of the object is decreasing at a <u>decreasing</u> rate	The acceleration of the object is decreasing at a decreasing rate
Gradient	The velocity is <u>decreasing</u> and negative.	The acceleration is <u>decreasing</u> and negative.	

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
	s/m	v/m s ⁻¹	a/m s ⁻²
Graph	Object is at rest	The velocity of the object is constant and negative	The acceleration of the object is constant and negative
Gradient	The velocity is zero	The acceleration is zero	

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
	s/m	v/m s ⁻¹	a/m s ⁻²
Graph	The distance of the object is increasing at a <u>constant</u> rate towards the negative direction	The speed of the object is increasing at a <u>constant</u> rate in the negative direction	The acceleration of the object is increasing at a constant rate and negative
Gradient	The velocity is <u>constant</u> and negative	The acceleration is <u>constant</u> and negative	

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
	s/m t/s	$v/m s^{-1}$	a/m s ⁻²
Graph	The distance of the object is increasing at an <u>increasing</u> rate towards the negative direction	The speed of the object is increasing at an <u>increasing</u> rate in the negative direction	The acceleration of the object is increasing at an increasing rate and negative
Gradient	The velocity is <u>increasing</u> and negative	The acceleration is <u>increasing</u> and negative	

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
	s/m t/s	$v/m s^{-1}$	a/m s ⁻²
Graph	The distance of the object is increasing at a <u>decreasing</u> rate towards the negative direction	The speed of the object is increasing at a <u>decreasing</u> rate in the negative direction	The acceleration of the object is increasing at a decreasing rate and negative
Gradient	The velocity is <u>decreasing</u> and negative	The acceleration is <u>decreasing</u> and negative	

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
	s/m t/s	v/m s ⁻¹	a/m s ⁻²
Graph	The distance of the object is decreasing at a <u>constant</u> rate towards the positive direction*	The speed of the object is decreasing at a <u>constant</u> rate in the negative direction	The acceleration of the object is decreasing at a constant rate and negative
Gradient	The velocity is <u>constant</u> and positive	The acceleration is <u>constant</u> and positive	

*Object is actually moving closer to the start point

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
	s/m t/s	v/m s ⁻¹	a/m s ⁻²
Graph	The distance of the object is decreasing at an <u>increasing</u> rate towards the positive direction*	The speed of the object is decreasing at an <u>increasing</u> rate in the negative direction	The acceleration of the object is decreasing at an increasing rate and negative
Gradient	The velocity is <u>increasing</u> and positive	The acceleration is <u>increasing</u> and positive	

*Object is actually moving closer to the start point

	Displacement-time graph	Velocity-time graph	Acceleration-time graph
	s/m t/s	v/m s ⁻¹	a/m s ⁻²
Graph	The distance of the object is decreasing at a <u>decreasing</u> rate towards the positive direction*	The speed of the object is decreasing at a <u>decreasing</u> rate in the negative direction	The acceleration of the object is decreasing at a decreasing rate and negative
Gradient	The velocity is <u>decreasing</u> and positive	The acceleration is <u>decreasing</u> and positive	

*Object is actually moving closer to the start point