Laplace is describing Newtonian determinism. Newton made the remarkable discovery that force, mass, and motion are related by the law
\[ a = \frac{F}{m}. \]

Suppose the force \( F \) that appears on the right side of Newton’s law is known. Then, by Newton’s law of motion, the acceleration \( \ddot{a} \) is known. We have already learned from our earlier work that if the acceleration \( \ddot{a}(t) \) is known, we can work backwards to find the velocity \( \dot{v}(t) \), and finally the position \( v(t) \). Thus, once forces are known (and initial conditions are specified), motion is completely determined. Therefore, if Newton is to be believed, the motion (future behavior) of everything in the Universe is completely determined! Likewise, one can also go backwards in time to determine what the past must have been.

When Laplace writes

\[
\text{We ought then to regard the present state of the universe as the effect of its anterior state.}
\]

he is merely stating that the past provides initial conditions that determine the present, and when he writes

\[
\text{and as the cause of the one which is to follow.}
\]

he is stating that the present provides initial conditions that determine the future.

When he writes

\[
\text{Given for one instant an intelligence which could comprehend all the forces by which nature is animated and the respective situation of the beings who compose it—an intelligence sufficiently vast to submit these data to analysis—it would embrace in the same formula the movements of the greatest bodies of the universe and those of the lightest atom; for it, nothing would be uncertain and the future, as the past, would be present to its eyes.}
\]

he is stating that a being of sufficient intelligence could use Newton’s law of motion to predict (determine) both the future and the past assuming that it knew all the forces.

In the rest of his paragraph Laplace describes how humans have been successful in doing this to some extent in the field of astronomy using the known force of gravity (what Laplace calls universal gravity), how we have had some other successes and might hope to have further successes in the future, how this might lead us to some knowledge of God (what Laplace calls the vast intelligence), and how such pursuits are noble.