Below is a list of three different types of time derivatives and their names, definitions, and some properties. Organize these into a table with one row for each type of derivative and appropriate headers for each column. (There should be eight columns and 24 cells, but there are only 23 items listed below, so one cell should be blank.)

1. $\frac{d(\ \ )}{dt}$
2. $\frac{\partial(\ \ )}{\partial t}$
3. $\frac{D(\ \ )}{Dt}$
4. $\frac{Q(\vec{r},t+\Delta t)-Q(\vec{r},t)}{(t+\Delta t)-t}$
5. Material, parcel, or Lagrangian derivative
6. Rate at which some (physical) property of a bit of matter (i.e., an "object", e.g., a fluid parcel) changes with respect to (w/r/t) time.
7. Rate of change of a physical property at a fixed location. Examples of fixed locations where this is relevant: weather station, stream gauge, anchored buoy.
8. $\vec{r}_{obj}(t)$: The location of some object (that is, a bit of matter), or in particular $\vec{r}_{parcel}(t)$, the location a fluid parcel. This might vary with (i.e., depend on) time (*t*).
9. Total derivative
10. $\vec{r}_{obs}(t)$: Location of an observer, instrument, or probe that can observe or measure a physical property of matter. The observer's location can vary with time (*t*).
11. Special case of the total derivative when (a) $\vec{c}_{obs}(t) = \vec{c}_{obj}(t)$ in general or $\vec{c}_{obs}(t) = \vec{U}(t)$ in particular, and $\vec{r}_{obs}(t) = \vec{r}_{obj}(t)$ in general or $\vec{r}_{obs}(t) = \vec{r}_{parcel}(t)$ in particular (that is, when the observer/instrument/probe "follows" an object, such as a fluid parcel).
12. Rate at which an observer, instrument, or probe observes or measures some field variable (a physical property) to change w/r/t time as the observer moves (or not) through space.

13. $\vec{c}_{obj}(t) \equiv \frac{D\vec{r}_{obj}(t)}{Dt}$, the velocity of a bit of matter (an object), or $\vec{U}(t) \equiv \frac{D\vec{r}_{parcel}(t)}{Dt}$, the velocity of a bit of fluid (i.e., a fluid parcel) in particular. This velocity is defined as the rate at which the object's (or parcel's) location in space varies with respect to time.

14. $\frac{Q(\vec{r}_{obj}(t+\Delta t),t+\Delta t)-Q(\vec{r}_{obj}(t),t)}{(t+\Delta t)-t}$

15. The rate at which some field variable (a physical property) changes w/r/t time at a fixed location.

16. $\vec{c}_{obs}(t) \equiv \frac{D\vec{r}_{obs}(t)}{Dt}$: Velocity of an observer, instrument, or probe that is capable of measuring some physical property of matter. This velocity is defined as the rate at which the observer's location in space varies with respect to time. (Might be better defined as $\frac{d\vec{r}_{obs}(t)}{dt}$, at least in some cases--have to think about this.)

17. $\vec{r}$: A location in space.

18. Local or Eulerian derivative

19. Hard to measure in practice, but theoretically extremely important because it appears in conservation laws. Rate of change with respect to time of a physical property of a bit of matter, "following" that bit of matter.

20. Rate of change with respect to time of some physical property observed or measured from a vehicle or platform that might be moving through the field of that physical property (such as a plane or boat or car).

21. $\frac{Q(\vec{r}_{obs}(t+\Delta t),t+\Delta t)-Q(\vec{r}_{obs}(t),t)}{(t+\Delta t)-t}$

22. Special case of the total derivative when $\vec{c}_{obs}(t) = 0$ (that is, when the observer/instrument/probe isn't moving).

23. Zero (0), the velocity of the location where observations/measurements are being made; i.e., this location isn't changing.