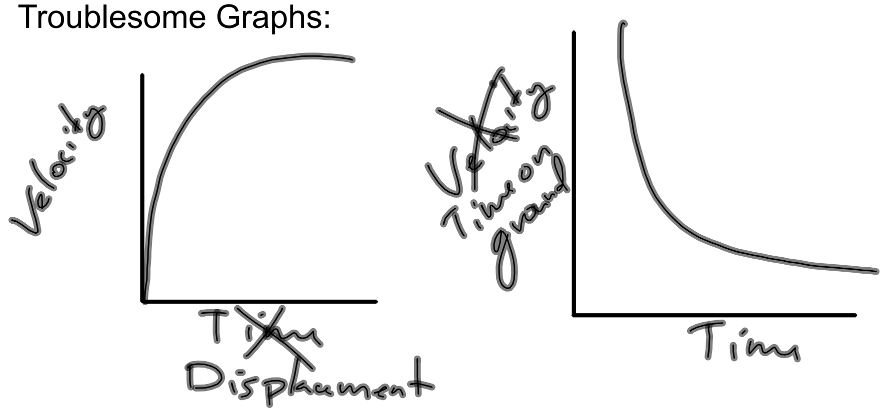
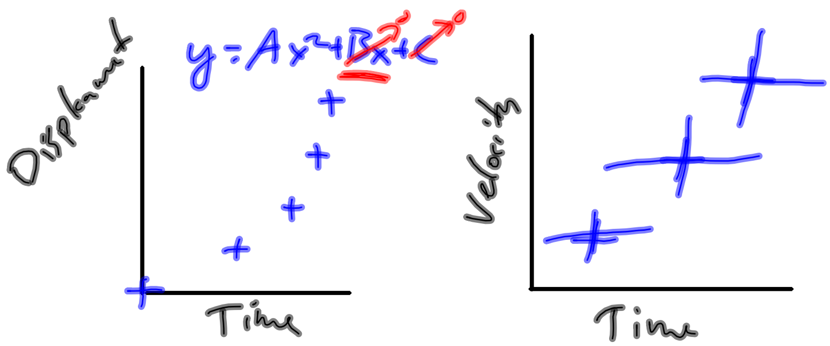
Troublesome Graphs:

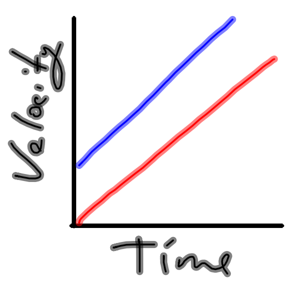


Correctly plotted graphs:



Acceleration

The rate of change of velocity



$V = At$

$V = at$ (a = acceleration)

$$V = at + V_0$$ (V_0 = initial velocity)

$\frac{V}{t} = \frac{at}{t}$

$a = \frac{V}{t}$

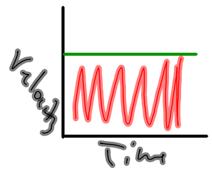
$\left[m/s/s\right] = \left[\frac{m/s}{s}\right] = \left[m/s^2\right]$

$$\Delta x = At^2$$
$$A = \frac{\Delta x}{t^2}$$
$$\left[\frac{m}{s^2}\right]$$

They are the same units as acceleration BUT they are definitely not the same values on our graphs!

1st explanation:

Constant Velocity

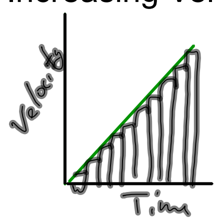


displacement over time

$$\Delta x = Vt$$

area for a constant velocity IS Displacement

Increasing Velocity:



$$\text{Area} = \frac{1}{2}b \cdot h$$
$$V = at$$
$$\text{Area} = \frac{1}{2}b(at)$$
$$= \frac{1}{2}T(aT)$$
$$= \frac{1}{2}aT^2$$

For an accelerating Object starting from rest we expect:

$$A = \frac{1}{2}a = 1.49$$
$$\Delta x = \frac{1}{2}at^2$$
$$\frac{1}{2}(2.8) = 1.4$$
$$V = at + V_0$$
$$A = a = 2.8$$

For an accelerating object with an initial velocity

$$\Delta x = \frac{1}{2}at^2 + V_0t$$
$$X_f - X_0 \, {}^{+X_0} = \frac{1}{2}at^2 + V_0t \, {}^{+X_0}$$
$$\boxed{X_f = \frac{1}{2}at^2 + V_0t + X_0}$$