# Discussion 2: Autonomous or Non-Autonomous DE

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1)

$$\frac{\mathrm{d}y}{\mathrm{d}x} + xy = 3 \implies \frac{\mathrm{d}y}{\mathrm{d}x} = 3 - xy = f(x, y)$$

As $\mathrm{d}y/\mathrm{d}x$ can not be expressed as a function of just $y$, it this DE is **non-autonomous**.

2)

$$\frac{\mathrm{d}y}{\mathrm{d}x} + y = 3x \implies \frac{\mathrm{d}y}{\mathrm{d}x} = 3x - y = f(x, y)$$

$\mathrm{d}y/\mathrm{d}x$ is dependent on both $x$ and $y$, meaning that this DE is **non-autonomous** as well.

3)

$$x\frac{\mathrm{d}y}{\mathrm{d}x} - y = 0 \implies \frac{\mathrm{d}y}{\mathrm{d}x} = \frac{y}{x} = f(x, y)$$

Because $\mathrm{d}y/\mathrm{d}x$ is a ratio of $y$ and $x$, it is dependent on both, so this DE is **non-autonomous**.

4)

$$\frac{\mathrm{d}y}{\mathrm{d}x} + 5y = 0 \implies \frac{\mathrm{d}y}{\mathrm{d}x} = -5y = g(y)$$

Since $\mathrm{d}y/\mathrm{d}x$ can be expressed as a function of $y$, this DE is **autonomous**.