**BMES CELL TEAM**
**SPRING 2021**

**Module 10A Worksheet**

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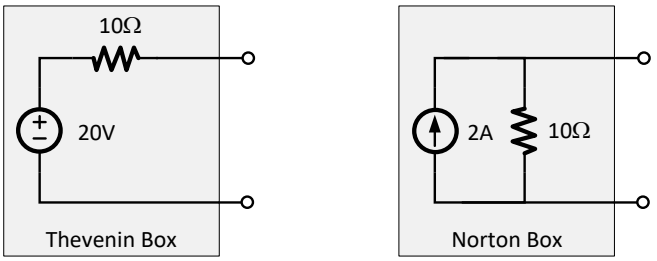
**Problem 1.** The following figure shows two circuits contained inside a black box, with an equivalent voltage output. Assume you do not know what is inside of these two boxes. Propose a way to identify which one is the Thevenin Equivalent and which one is the Norton Equivalent. *Hint*: You do not have to do any math to find the answer, and you do not have to know about the Thevenin-Norton Theorem.




**Problem 2.** What is the solution to the following differential equation? Let $y = 1$ at $t = 0$.

$$\frac{dy}{dt} + 2y = 0$$

**Problem 3.** What is the solution to the following differential equation? Let $y = 0$ and $\frac{dy}{dt} = -1$ at $t = 0$.

$$\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 2y = 0$$

**Problem 4.** Assume you have a series RLC circuit with a sinusoidal current source described by the following function.

$$i(t) = \alpha \cos(\gamma t + \phi)$$

Derive expressions for $v_L$, $v_c$, and $v_R$ as a function of time. Also, please explain the behavior of the capacitor and inductor at steady state ($t \to \infty$).