

# Steady State Practice

Check your solutions using the slope field: [geogebra.org/m/W7dAdgqc](https://www.geogebra.org/m/W7dAdgqc)

1. Find the steady states of all the following functions and state their stability

a.

$$\frac{dy}{dt} = y(3 - y)^2$$

b.

$$\frac{dy}{dt} = ty - 2t$$

c.

$$\frac{dy}{dt} = y(y - 1)^2(2 - y)(y - 3)$$

2. Write a differential equation for  $\frac{dy}{dt}$  that has the stated steady states
- Stable steady state at  $y = 5$  and unstable steady state at  $y = 0$ .
  - Stable steady state at  $y = -3$ , a semi-stable steady state  $y = 4$ , and unstable steady state at  $y = 9$
  - Sem-stable steady states at  $y = 1$  and  $y = 6$ , stable steady state at  $y = 2$  and unstable steady state at  $y = -1$ .

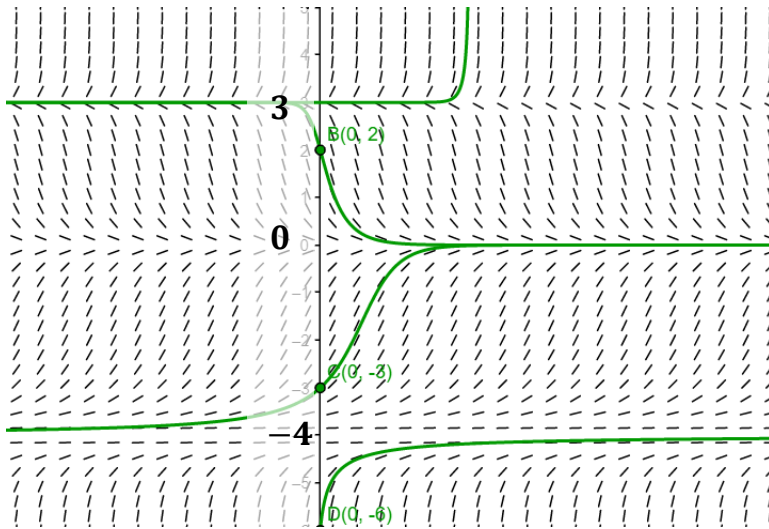
3. A differential equation  $\frac{dy}{dt} = f(y)$  has exactly 2 steady states. Show that they cannot both be stable or unstable.

4. Determine the steady states and stability of the following differential equation.

$$\frac{dM}{dr} = \frac{(M^2 - 4)(r + 1)}{r^2 + 1}$$

5. From the following slope fields, make a differential equation that could match it **given the appropriate variables!**

a. The solution curves are for the differential  $\frac{dF}{db}$



b. The solution curves are for the differential  $\frac{dz}{dx}$

