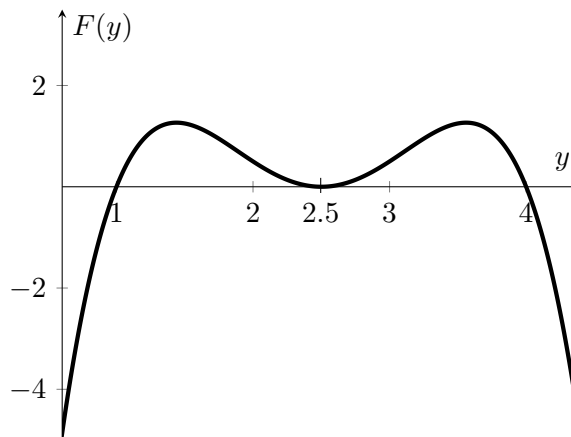**8.** [10 points] Consider the differential equation

$$\frac{dy}{dt} = F(y)$$

where $F(y)$ is graphed below.

a. [4 points] Identify all equilibrium solutions to the equation above.

> *Solution:* We can find equilibrium solutions by setting $\frac{dy}{dt}$ to zero in the differential equation above and solving for y. In this case, this tells us that equilibrium solutions will be zeros of the function $F(y)$. From the graph, we then see that the equilibrium solutions will be $y = 1$, $y = 2.5$, and $y = 4$.

b. [4 points] Determine the stability of each equilibrium solution of the differential equation.

> *Solution:* The equilibrium solutions $y = 1$ and $y = 2.5$ are unstable. The equilibrium solution $y = 4$ is stable.

c. [2 points] Suppose $y(t)$ solves the differential equation above subject to the initial condition $y(0) = 3$. Compute $\lim_{t \to \infty} y(t)$. Write your answer in the blank provided.

> *Solution:*

$$\lim_{t \to \infty} y(t) = \underline{\quad 4 \quad}$$