

Steady States and Natural Growth Quiz

Name: _____ Due Date: April 28, 2020

1. Solve the differential equations.

(a) $\frac{dy}{dt} = \frac{y}{3}; \quad y(0) = 10$

(b) $\frac{dz}{dx} = 2 - 3z; \quad z(0) = -2$

2. Determine the steady states and their stability of the following differential equation

$$\frac{dp}{dq} = (1 - p) \cdot (2 - p)^2 \cdot (3 - q) \cdot (4 - q)$$

3. Inflation in Canada is increasing the price of goods at a per capita rate of 2.3% per year. If a cup of coffee is \$3 right now, what will the price be in 20 years? Write the differential equation in your solution.

4. A person learning to speed solve a Rubiks cube takes 300 seconds to solve it after learning how. They keep practicing so the rate their solve time changes is proportional to the the amount of time they can improve. Using their current method, their theoretical best time is 20 seconds. After 12 weeks their best time is 45 seconds. Write a differential equation for their solve time. Use the differential equation to determine when they will have gotten a best time of 30 seconds.