

Quiz 8

Name: Key*You must show your work to get full credit.*Let $P(t)$ satisfy the rate equation

$$\frac{dP}{dt} = .1P(P - 10)(20 - P).$$

1. If $P(3) = 7$ what is $P'(3)$? $P'(3) = \underline{-27.3}$

$$P'(t) = .1P(t)(P(t) - 10)(20 - P(t))$$

so if $P(3) = 7$ we have

$$P'(3) = .1P(3)(P(3) - 10)(20 - P(3)) \\ = .1(7)(7 - 10)(20 - 7) = .1(7)(-3)(13) = -27.3$$

2. What are the stationary solutions?

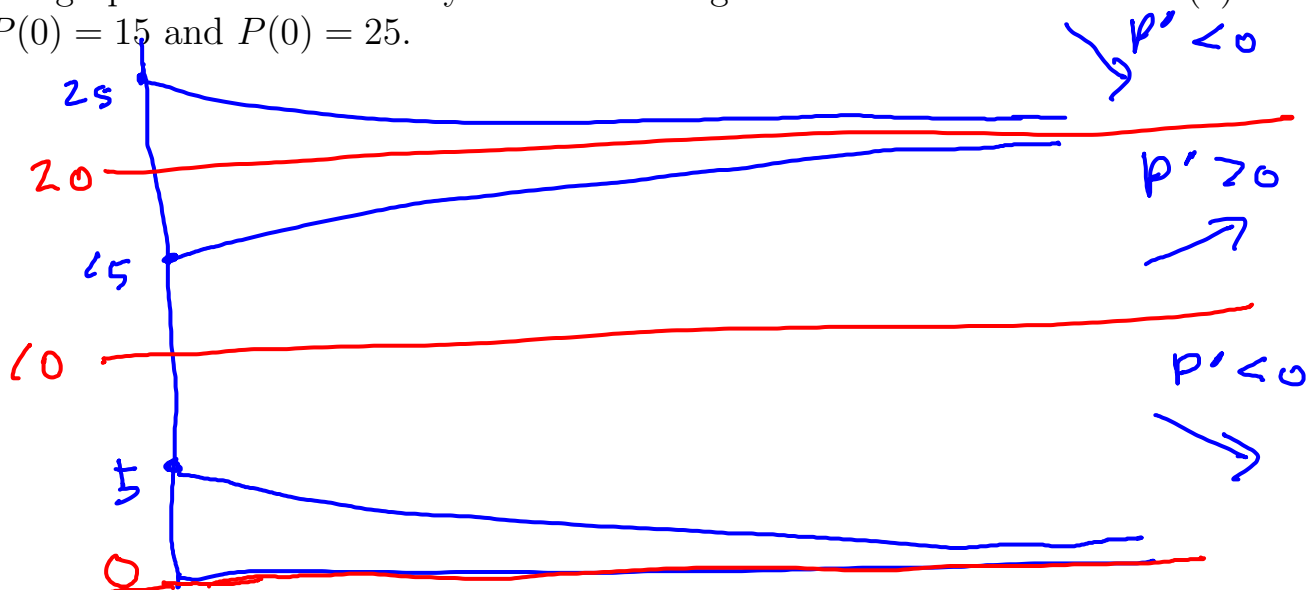
Stationary solutions are $\underline{P = 0, 10, 20}$

$$\text{Solve } .1P(P - 10)(20 - P) = 0$$

The solutions are

$$P = 0, 10, 20$$

3. Make a graph with t on the horizontal axis and P on the vertical axis showing the graphs of the stationary solutions along with the solutions with $P(0) = 5$, $P(0) = 15$ and $P(0) = 25$.



4. If $P(0) = 15$ estimate $P(150)$. $P(150) = \underline{20}$

Starting at $P(0) = 15$ the asymptote is $P = 20$ so solution goes to 20