

Mathematics 172

Quiz 5

Name: _____

Key

You must show your work to get full credit.

Let $P(t)$ satisfy the differential equation, (also called a rate equation)

$$\frac{dP}{dt} = -.05P(P - 10)(P - 30).$$

(1) If $P(0) = 20$, than what is $P'(0)$? $P'(0) = \underline{100}$

$$\begin{aligned} P'(0) &= -.05(20)(20-10)(20-30) \\ &= -.05(20)(10)(-10) \\ &= 100 \end{aligned}$$

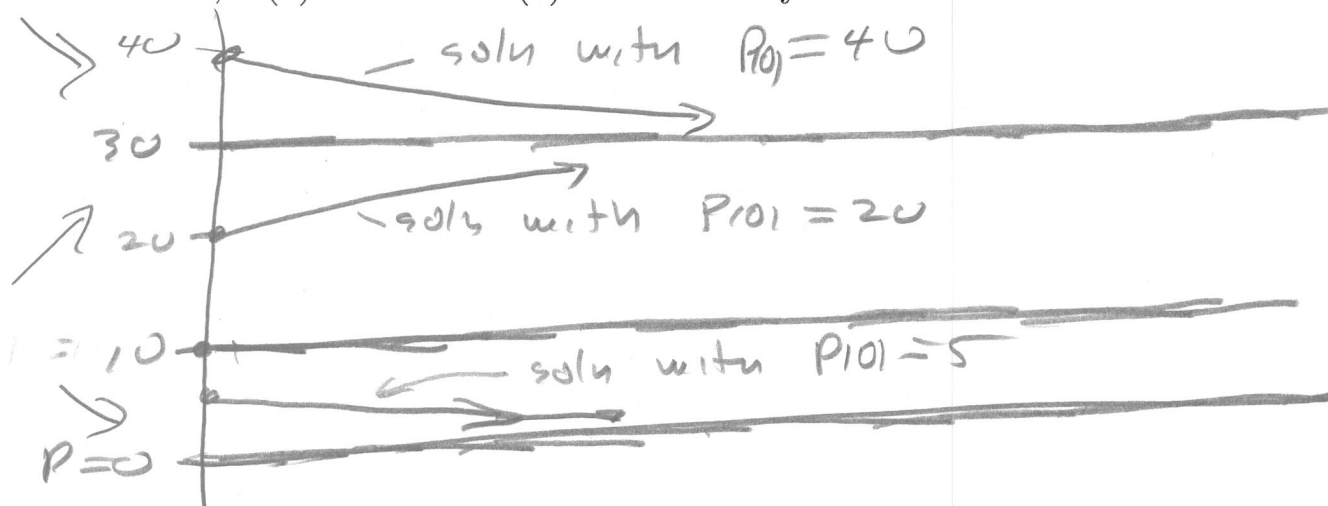
(2) What are the stationary solutions? $P=0, P=10, P=30$

To find these solve

$$\frac{dP}{dt} = -.05P(P-10)(P-30)$$

which has solutions $P=0, P=10, P=30$

(3) Make a graph showing the solutions to the differential equation with $P(0) = 5, P(0) = 20$ and $P(0) = 40$. Label your solutions.



(4) For the solution with $P(0) = 20$ estimate $P(1,000)$.

From the graph we see that $P(1,000) \approx \underline{30}$

this solution has $P=30$ as an asymptote. so $P(1,000) \approx 30$