Mathematics 172

Quiz #3 Name: Key

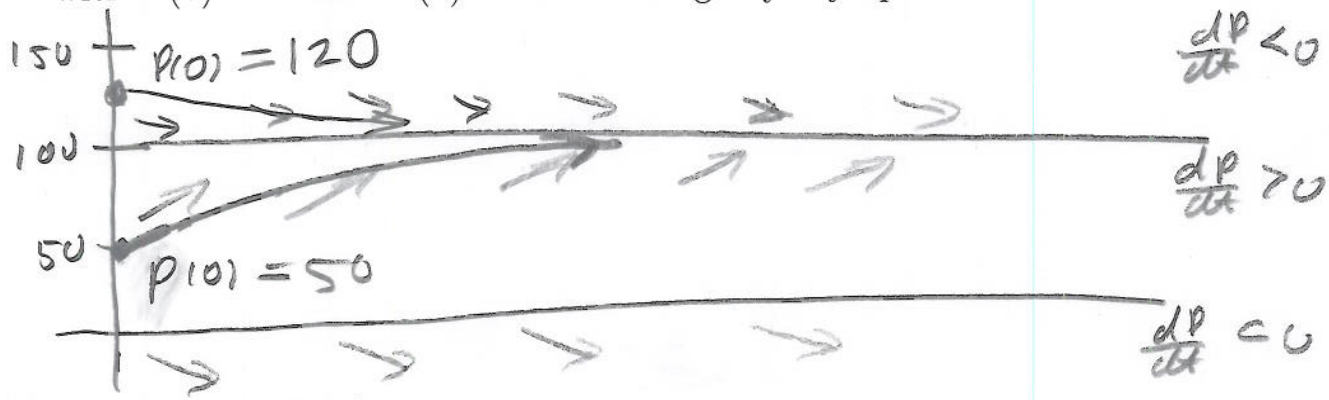
You must show your work to get full credit.

(1) Graph the solutions to

$$\frac{dP}{dt} = .05P\left(1 - \frac{P}{100}\right)$$

2 pts

with $P(0) = 50$ and $P(0) = 120$ showing any asymptotes.



(2) For the rate equation

$$\frac{dP}{dt} = .1(P - 300)$$

(1) 2 pts do the substitution $y = P - 300$.

(a) What is the rate equation for y?

$\frac{dy}{dt} = .1y$

$\frac{dy}{dt} = \frac{dP}{dt} - 0 = \frac{dP}{dt} = .1(P-300) = .1y$

1 pt (b) Find the solution to equation (1) with $P(0) = 200$.

$300 - 100e^{.1t}$

$\frac{dy}{dt} = .1y$ has the solution $y = y(0)e^{.1t}$

But $y = P - 300$ Thus

$P - 300 = (P(0) - 300)e^{.1t}$

$= (200 - 300)e^{.1t} = -100e^{.1t}$

so $P = 300 - 100e^{.1t}$