Homework for Friday, September 3

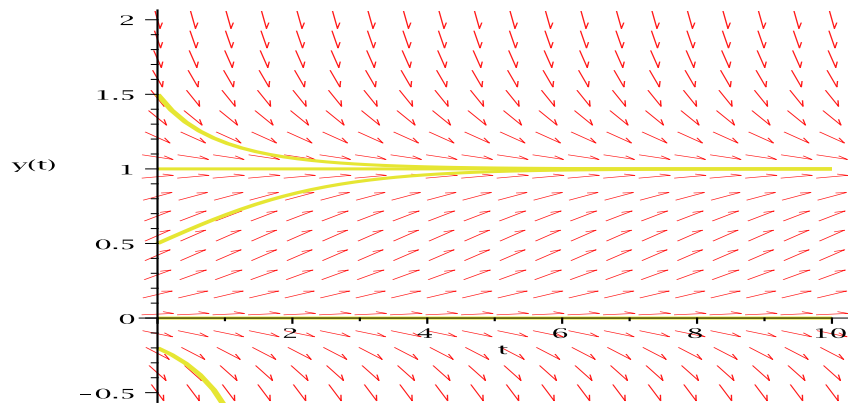

FIGURE 1. The solutions to $y' = .8y(1 - y)$ with the initial conditions $y(0) = -.2$, $y(0) = 0$, $y(0) = .5$, $y(0) = 1$, $y(0) = 1.5$

Problem 1. For the equation in Figure 1 find $\lim_{t\to\infty} y(t)$ when $y(0) = .1$, $y(0) = .3$, $y(0) = .9$, $y(0) = 1.3$, $y(0) = 2.3$, $y(0) = -.1$.

Solution. When $y(0) = .1$, $y(0) = .3$, $y(0) = .9$, $y(0) = 1.3$ or $y(0) = 2.3$ we have $\lim_{t\to\infty} = 1$. When $y(0) = -.1$ we have $\lim_{t\to\infty} = -\infty$ $\qquad\square$

Problem 2. Graph some solutions to
$$\frac{dP}{dt} = .2P\left(1 - \frac{P}{900}\right)$$
and find $\lim_{t\to\infty} P(t)$ when $P(0) = 100$, $P(0) = 400$, $P(0) = 1{,}200$.

Problem 3. Graph some solutions to $y' = y(y-1)(y-3)$ and find $\lim_{t\to\infty} y(t)$ when $y(0) = .5$, $y(0) = 2$ and $y(0) = 4$.

Problem 4. Let $0a < b$. Graph some solutions to $y' = .05y(y - a)(y - b)$. If $0 < y(0) < a$, then estimate $y(1{,}000)$. If $a < y(0) < b$, estimate $y(1{,}000)$.