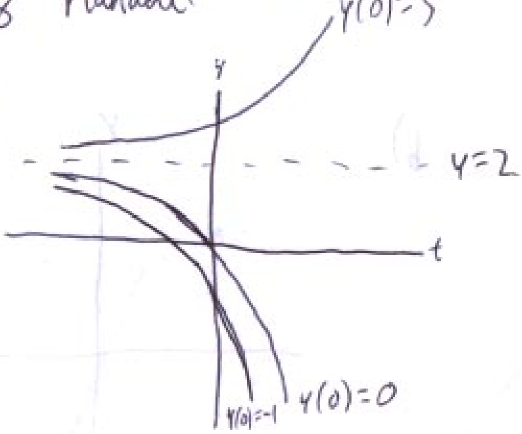
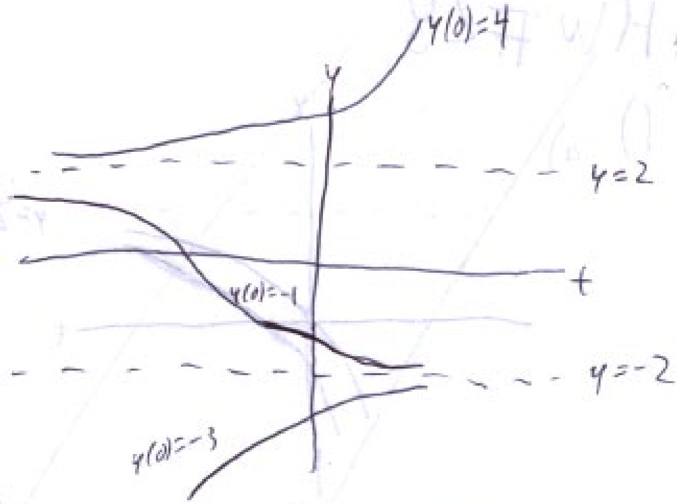
HW #28 Handout-Supplement pp. 14-15

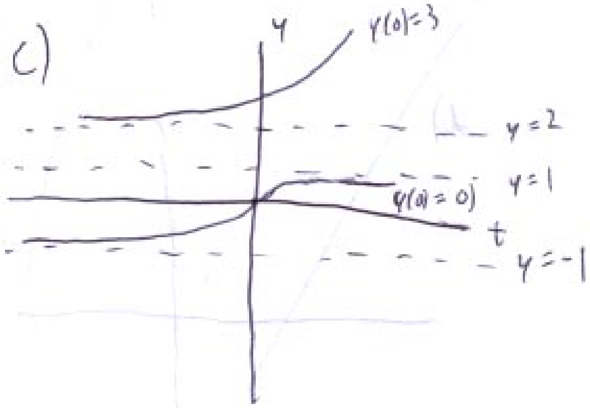
1) a)



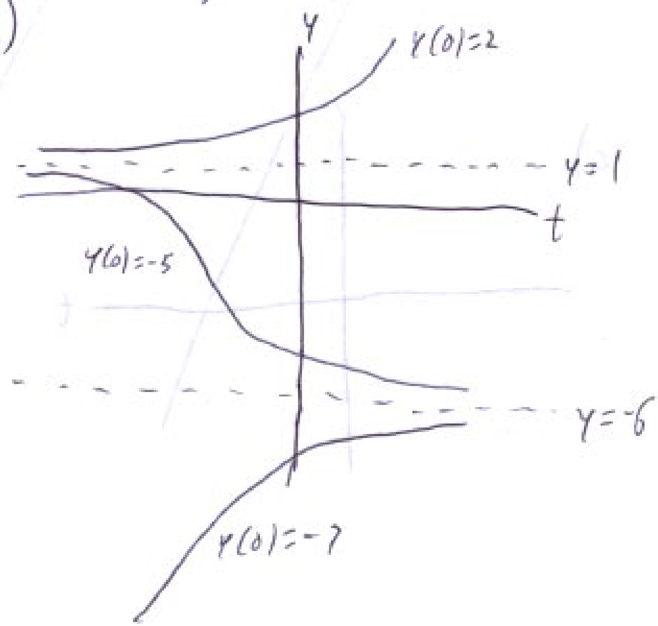
b)



c)



d)



2) a) $y' = 3-y$ b) $y' = y-3$ c) $y' = y(2-y)$ d) $y' = (y+1)(y-1)$

3) a) $y=3$ stable b) $y=3$ unstable c) $y=2$ stable, $y=0$ unstable d) $y=1$ unstable, $y=-1$ stable.

4) a) $y=1$, $y=3$, $y=5$

b) $y(0)<1$, $3<y(0)<5$

P. 997 #3

a) $\frac{d(Ce^{kt})}{dt} \stackrel{?}{=} kCe^{kt} \rightarrow kCe^{kt} = kCe^{kt}$.

b) $\frac{d(ke^{t})}{dt} \stackrel{?}{=} ke^{t} \neq k \cdot ke^{t}$.

c) $\frac{d(e^{kt}+C)}{dt} = ke^{kt} \neq k(e^{kt}+C)$.

3. $y' = y - 1$. The slopes at each point are independent of x, so the slopes are the same along each line parallel to the x-axis. Thus, IV is the direction field for this equation. Note that for $y = 1$, $y' = 0$.

4. $y' = y - x = 0$ on the line $y = x$, when $x = 0$ the slope is y, and when $y = 0$ the slope is $-x$. Direction field II satisfies these conditions. [Looking at the slope at the point $(0, 2)$, II looks more like it has a slope of 2 than does direction field I.]

5. $y' = y^2 - x^2 = 0 \;\Rightarrow\; y = \pm x$. There are horizontal tangents on these lines only in graph III, so this equation corresponds to direction field III.

6. $y' = y^3 - x^3 = 0$ on the line $y = x$, when $x = 0$ the slope is y^3, and when $y = 0$ the slope is $-x^3$. The graph is similar to the graph for Exercise 4, but the segments must get steeper very rapidly as they move away from the origin, because x and y are raised to the third power. This is the case in direction field I.

9.