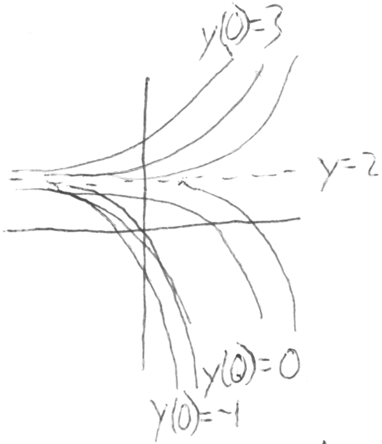
Supp. pg. 14-15 # 1-4

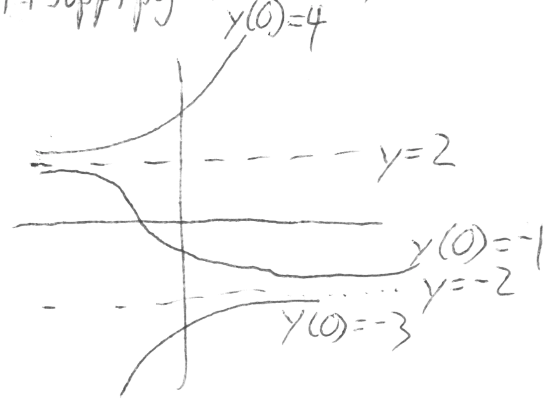
7.2 # 3-6

Extra Credit: Supp. pg. 1000 #17

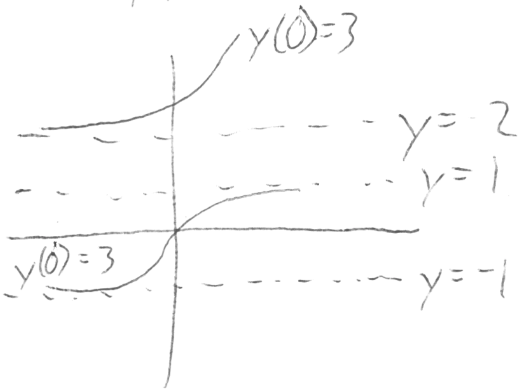
1) a)



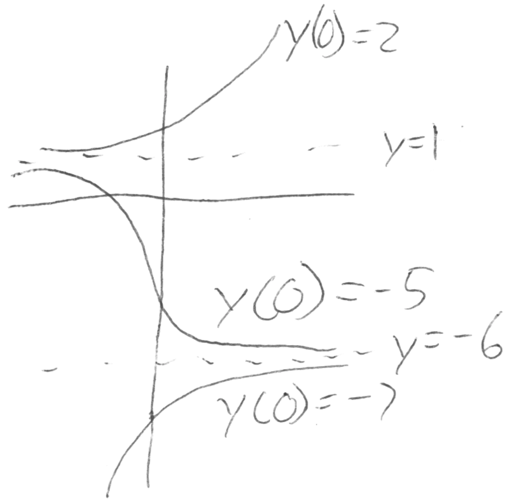
b)



c)



d)



2) a) $\frac{dy}{dt} = 3-y$ b) $\frac{dy}{dt} = y-3$ c) $\frac{dy}{dt} = (2-y)y$ d) $\frac{dy}{dt} = (y-1)(y+1)$

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) $y=1, 3$, and 5 which are the zeroes of the graph.

b) When $g(y) > 0$, so $(-\infty, 1) \cup (3, 5)$

7.2

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.

Supp. pg. 1000 #17
extra credit

17) a) $\frac{dP}{dt} = kP - E$

$$\int \frac{dP}{kP-E} = \int dt$$

$$\frac{\ln(kP-E)}{k} = t + C$$

$$\ln(kP-E) = kt + kC$$

$$kCe^{kt} = kP - E$$

$$Ce^{kt} = P - \frac{E}{k}$$

$$\boxed{P = Ce^{kt} + \frac{E}{k}}$$

b) $\frac{dP}{dt} = kCe^{kt}$

$$kCe^{kt} \stackrel{?}{=} k\left(Ce^{kt} + \frac{E}{k}\right) - E$$

$$\stackrel{?}{=} kCe^{kt} + E - E$$

$$\stackrel{\checkmark}{=} kCe^{kt}$$

So, this is the solution.