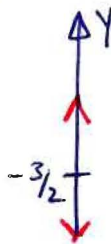


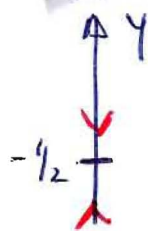
Solutions to HW#1

#1.1. #3.  $y' = 3 + 2y$   
 $3 + 2y > 0$   
 $y < -3/2$



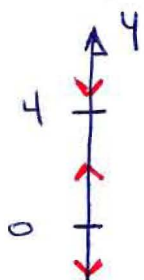
$$\lim_{t \rightarrow \infty} y = \begin{cases} +\infty & \text{if } y_0 > -3/2 \\ -3/2 & \text{if } y_0 = -3/2 \\ -\infty & \text{if } y_0 < -3/2 \end{cases}$$

#4.  $y' = -1 - 2y$   
 $-1 - 2y > 0$   
 $y < -1/2$



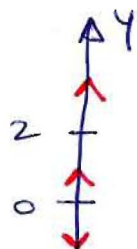
$$\lim_{t \rightarrow \infty} y = -1/2$$

#11.  $y' = y(4 - y)$   
 $y(4 - y) > 0$   
 $y < 0$  or  $y < 4$



$$\lim_{t \rightarrow \infty} y = \begin{cases} 4 & \text{if } y_0 > 0 \\ 0 & \text{if } y_0 = 0 \\ -\infty & \text{if } y_0 < 0 \end{cases}$$

#14.  $y' = y(y - 2)^2$   
 $y(y - 2)^2 > 0$   
 $y < 0$  or  $y > 2$



$$\lim_{t \rightarrow \infty} y = \begin{cases} +\infty & \text{if } y_0 > 2 \\ 2 & \text{if } 0 < y_0 \leq 2 \\ 0 & \text{if } y_0 = 0 \\ -\infty & \text{if } y_0 < 0 \end{cases}$$

#15. equil. soln is  $y = 2 \Rightarrow$  (c) or (j)

$y \rightarrow 2 \Rightarrow$  (j)

#16. equil. soln is  $y = 2 \Rightarrow$  (c) or (j)

$y \rightarrow \begin{cases} +\infty & y_0 > 2 \\ 2 & y_0 = 2 \\ -\infty & y_0 < 2 \end{cases} \Rightarrow$  (c)

#17. equil. soln is  $y = -2 \Rightarrow$  (b) or (g)

$y \rightarrow -2 \Rightarrow$  (g)

#18. equil. soln is  $y = -2 \Rightarrow$  (b) or (g)

$y \rightarrow \begin{cases} +\infty & y_0 > -2 \\ -2 & y_0 = -2 \\ -\infty & y_0 < -2 \end{cases} \Rightarrow$  (b)

#19. equil. soln are  $y = 0$  &  $y = 3 \Rightarrow$  (e) or (h)

$y \rightarrow \begin{cases} 3 & \text{if } y_0 > 0 \\ 0 & \text{if } 0 \leq y_0 < 3 \\ -\infty & \text{if } y_0 < 0 \end{cases} \Rightarrow$  (h)

#20. \_\_\_\_\_ u \_\_\_\_\_

$y \rightarrow \begin{cases} +\infty & \text{if } y_0 > 3 \\ 3 & \text{if } y_0 = 3 \\ 0 & \text{if } y_0 < 3 \end{cases} \Rightarrow$  (e)