(09.15.2014) Question 1: The differential equation ***y'=(y-2)(t-3)*** has equilibrium values of?

(a) $y = 2$ only (c) $y = 2$ and $t = 3$

(b) $t = 3$ only (d) No equilibrium values

Equilibrium values are values y* of the **dependent** variable that cause the differential equation y'=f(t,y) to equal zero, i.e. f(t,y*)=0.

(09.15.14) Question 2: Suppose 3 is an equilibrium value of a differential equation. This means that

(a) the values will approach 3.

(b) if the initial value is below 3, the values will decrease.

(c) if the initial value is 3, then all of the values will be 3.

(d) all of the above.

The meaning of an equilibrium value (or stationary point) means that once the dependent variable equals that value (i.e. At the initial condition) it will remain at that value.

(09.15.2014) Question 3:We know that a given DE is in the form $y' = f(y)$ where f is a continuous function of y. Suppose that $f(6)=0$, $f(14)=0$ and $y(10)=10$.

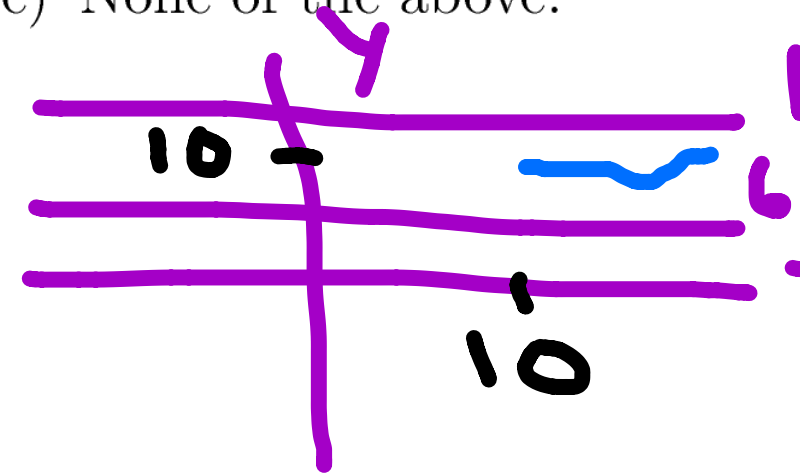
(a) This means that $y(0)$ must have been between 6 and 14.

(b) This means that $y(20) = 0$ is impossible.

(c) This means that $y(20) = 20$ is impossible.

(d) All of the above.

(e) None of the above.



The solution must be trapped between y=6 and y=14 for all values of time so (a),(b),(c) are true!

(09.15.2014) Question 4: We know that a given DE is in the form $y' = f(y)$ where f is a continuous function of y. Suppose that $f(2)=3$ and $y(0)=0$. Which of the following is impossible?

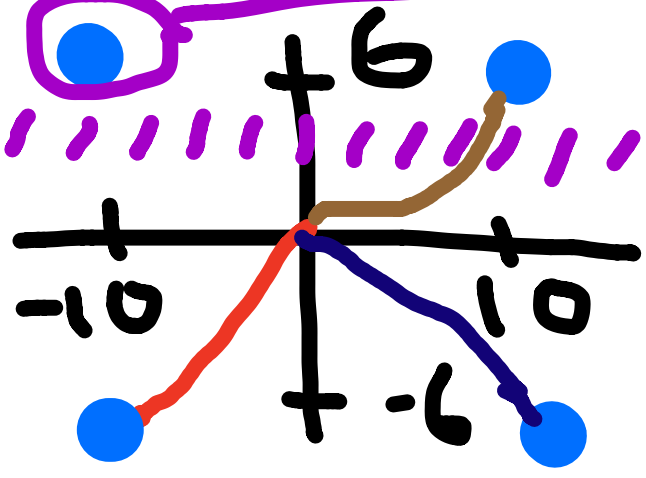
(a) $y(10) = 6$

(b) $y(10) = -6$

(c) $y(-10) = 6$

(d) $y(-10) = -6$

(e) All of these are possible



$y'=3$ when $y=2$

No way to get from here to origin

(09.15.2014) Question 5: Consider the differential equation ***f'=af+b***, where *a* and *b* are non-negative parameters. This differential equation will have no equilibrium if

A. a=0

B.b=0

C.a=1

D.More than one of the above.

Equilibrium value
$af+b=0 \Rightarrow f=-b/a$.
So if a=0 there is no equilibrium!

(09.15.2014) Question 6: TRUE or FALSE. "A differential equation could have infinitely many equilibria."

A. TRUE **B. FALSE**

Sure! If $y' = f(y)$ can have infinite roots.

example

$f(y) = \sin(y)$