SHOW ALL YOUR WORK

1. (*10 points*). Here is an IVP that you have seen before:

$$y'(t) = 3t - y, \qquad y(0) = 2$$

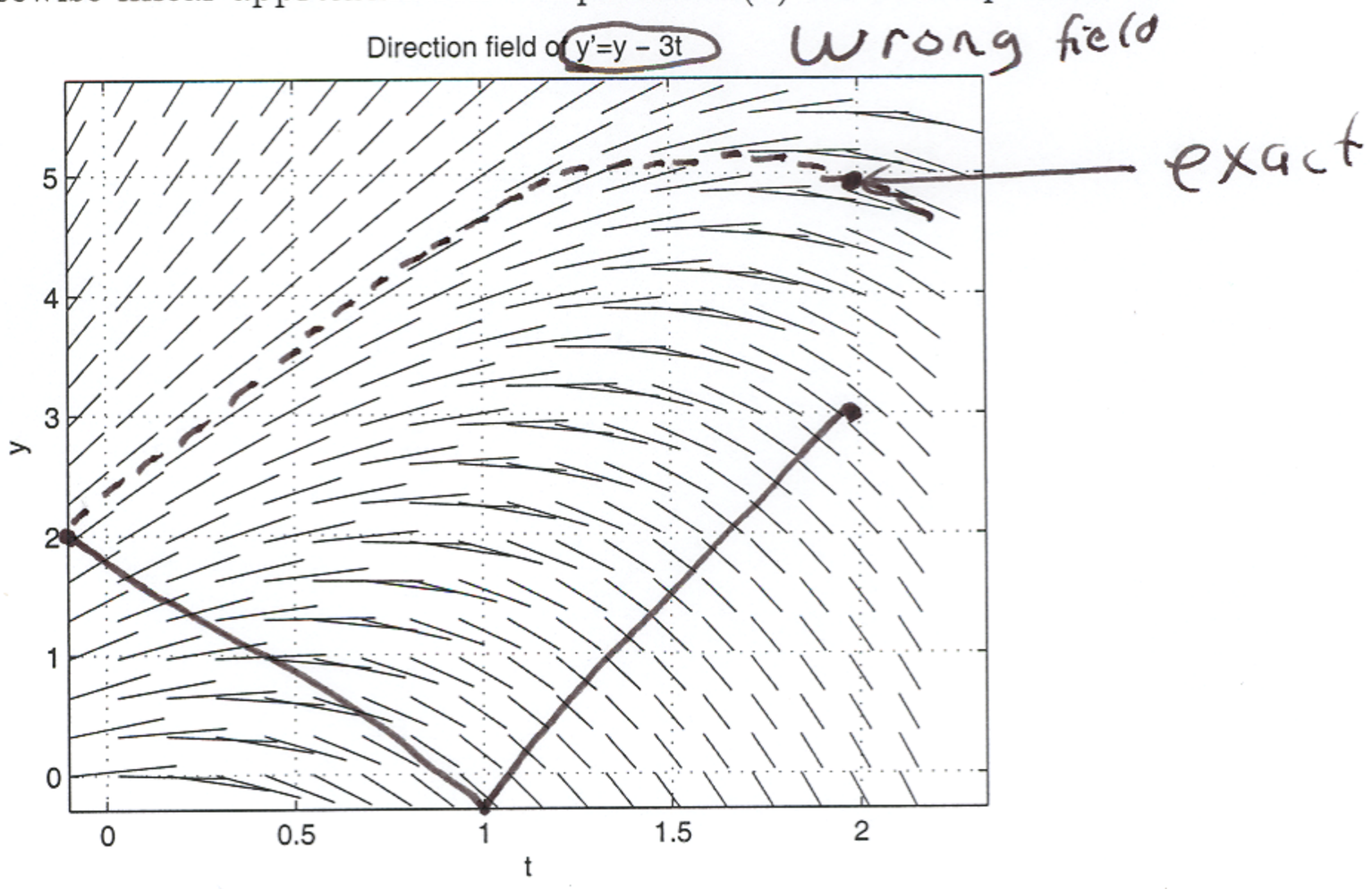
a. (*4 points*) Obtain an approximation for $y(2)$ using Euler's Method with $\Delta t = 1$.

$\Delta y \approx y' \cdot \Delta t$

$y_{new} = y_{old} + \Delta y$

t	y	$\Delta y'$	Δy
0	2	-2	-2
1	0	3	3
2	3		

b. (*2 points*) Sketch your piecewise linear approximation computed in (a) on the slope field below.



c. (*2 points*) Find the equation for each line segment in your piecewise linear approximation obtained in (a) and sketched in (b).

For $0 < t < 1$, $y(t) = 2 + (t-0)\cdot(-2) = 2 - 2t$

For $1 < t < 1$, $y(t) = 0 + 3\cdot(t-1) = -3 + 3t$

d. (*2 points*) Based on the slopefield and your Euler's method calculation, do you think the EXACT value of $y(2)$ is larger or smaller than the value calculated using Euler's Method? Explain.

The estimate based on Euler's Method will be an underestimate of the exact value of $y(2)$ due to the shape of the slope field. Following a solution curve from $(4,2)$ demonstrates that at $t=2$, the exact value is greater than Euler's