Assignment 8 Problem 3

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March 27, 2016

3. Match the slope fields in Figure 1 with their differential equations. Briefly explain/justify your choice of slope field.

(a) $y' = -y$

(b) $y' = y$

(c) $y' = x$

(d) $y' = \frac{1}{y}$

(e) $y' = y^2$

Slope field I corresponds to equation b). I was able to identify this by observing a few of the y-coordinates. For example, as the y-coordinates increase from $y = 0$, y' becomes increasingly positive, and vice versa as the y-coordinates decrease from $y = 0$. Thus with a positive proportional relationship, the slope field must correspond to $y' = y$.

Slope field II corresponds to equation a). There is an exact opposite effect of increasing and decreasing y-coordinates from the point $y = 0$ from Slope field I, and thus I concluded that $y' = -y$ since the multiplicative inverse indicates the opposite behavior of y' given y.

Slope field III corresponds to d). If you observe the y-coordinates increasing, you will see that y' starts off high but gradually decreases as y increases (however never becoming negative). This is consistent with the definition $y' = \frac{1}{y}$, where the smaller the value of y (if y is positive that is) the larger the value of y'.

Slope field IV corresponds to e). Again there is a similar comparison to Slope field III in that instead of y' gradually decreasing as y increases, the rate at which y' increases increases as y increases. This is characteristic of the definition $y' = y^2$.

Slope field V corresponds to c) because the slope field is affected by changes in x and not changes in y, and since the only differential equation that is reliant on x is c), that must be the corresponding differential equation.