Do Now: 2004 AB 6

Name:_____ Date:_____

AP Calculus AB: Slope Fields Ms. Loughran

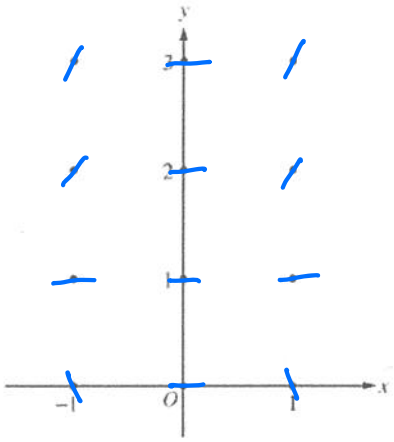
2004 AB 6

Consider the differential equation $\frac{dy}{dx} = x^2(y-1)$.

$\frac{dy}{dx} = 0$, when $x=0$ or $y=1$

(a) On the axes provided, sketch a slope field for the given differential equation at the twelve points indicated. **(Note: Use the axes provided in the pink test booklet.)**

point	slope
$(-1,2)$	1
$(1,2)$	1
$(-1,3)$	2
$(-1,0)$	-1
$(1,0)$	-1
$(1,3)$	2



(b) While the slope field in part (a) is drawn at only twelve points, it is defined at every point in the xy-plane. Describe all points in the xy-plane for which the slopes are positive. $y > 1$, $x \neq 0$

(c) Find the particular solution $y = f(x)$ to the given differential equation with the initial condition $f(0) = 3$.

$(0,3)$

$$\frac{dy}{dx} = x^2(y-1)$$

$$\int \frac{dy}{y-1} = \int x^2\,dx$$

$$\ln|y-1| = \frac{x^3}{3} + C$$

$$\ln|3-1| = 0 + C$$

$$\ln 2 = C$$

$$\ln|y-1| = \frac{x^3}{3} + \ln 2$$

$$e^{\ln|y-1|} = e^{\frac{x^3}{3}} \cdot e^{\ln 2}$$

$$|y-1| = 2e^{\frac{x^3}{3}}$$

$$y-1 = \pm 2e^{\frac{x^3}{3}}$$

$$y = \pm 2e^{\frac{x^3}{3}} + 1$$

$$y = 2e^{\frac{x^3}{3}} + 1$$

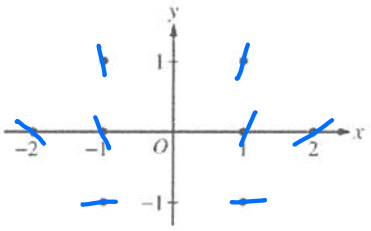
2006 AB 5

$\frac{dy}{dx} = 0$ $y = -1$, $x \neq 0$

$\frac{dy}{dx}$ undefined $x = 0$, $y \neq -1$

Consider the differential equation $\frac{dy}{dx} = \frac{1+y}{x}$, where $x \neq 0$.

(a) On the axes provided, sketch a slope field for the given differential equation at the eight points indicated.
(Note: Use the axes provided in the pink exam booklet.)



point	slope
$(-2,0)$	$-\frac{1}{2}$
$(2,0)$	$\frac{1}{2}$
$(-1,0)$	-1
$(1,0)$	1
$(-1,1)$	-2
$(1,1)$	2

(b) Find the particular solution $y = f(x)$ to the differential equation with the initial condition $f(-1) = 1$ and state its domain.

$(-1,1)$

$$\frac{dy}{dx} = \frac{1+y}{x}$$

$$\int \frac{dy}{1+y} = \int \frac{dx}{x}$$

$$\ln|1+y| = \ln|x| + C$$

$$\ln|1+1| = \ln|-1| + C$$

$$\ln 2 = \ln 1 + C$$

$$\ln 2 = C$$

$$\ln|1+y| = \ln|x| + \ln 2$$

$$e^{\ln|1+y|} = e^{\ln|x|} \cdot e^{\ln 2}$$

$$|1+y| = 2|x|$$

$$1+y = \pm 2|x|$$

$$y = \pm 2|x| - 1$$

$$y = 2|x| - 1$$