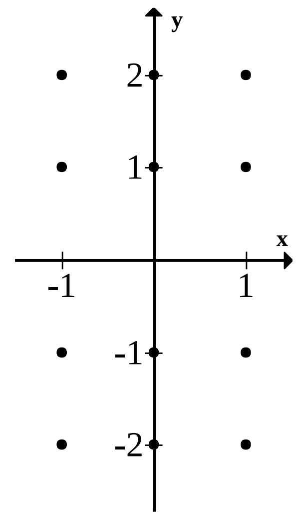
AP Calculus AB 2010 Form B #5 No Calculator



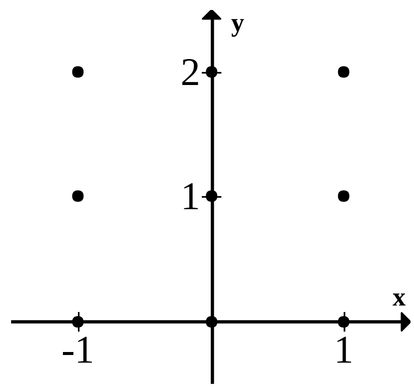
#5 Consider the differential equation $\frac{dy}{dx} = \frac{x+1}{y}$.

(a) On the axes provided, sketch a slope field for the given differential equation at the twelve points indicated, and for $-1 < x < 1$, sketch the solution curve that passes through the point $(0, -1)$.

(b) While the slope field in part (a) is drawn only at twelve points, it is defined at every point in the *xy*-plane for which $y \neq 0$. Describe all points in the *xy*-plane, $y \neq 0$, for which $\frac{dy}{dx} = -1$.

(c) Find the particular solution $y = f(x)$ to the given differential equation with the initial condition $f(0) = -2$.

AP Calculus AB 2007 Form B #5 No Calculator



#5 Consider the differential equation $\frac{dy}{dx} = \frac{1}{2}x + y - 1$

(a) On the axes provided, sketch a slope field for the given differential equation at the nine points indicated.

(b) Find $\frac{d^2y}{dx^2}$ in terms of *x* and *y*. Describe the region in the *xy*-plane in which all solution curves to the differential equation are concave up.

(c) Let $y = f(x)$ be a solution to the differential equation with the initial condition $f(0) = 1$. Does *f* have a relative minimum, relative maximum, or neither at $x = 0$? Justify your answer.

(d) Find the values of *m* and *b* for which $y = mx + b$ is a solution to the differential equation.

AP Calculus AB 2010 #6 No Calculator

Solutions to the differential equation $\frac{dy}{dx} = xy^3$ also satisfy $\frac{d^2y}{dx^2} = y^3\left(1+3x^2y^2\right)$. Let $y = f\left(x\right)$ be a particular solution to the differential equation $\frac{dy}{dx} = xy^3$ with $f\left(1\right) = 2$.

(a) Write an equation of the line tangent to the graph of $y = f\left(x\right)$ at $x = 1$.

(b) Use the tangent line from part (a) to approximate $f\left(1.1\right)$. Given that $f\left(x\right) > 0$ for $1 < x < 1.1$, is the approximation for $f\left(1.1\right)$ greater or less than $f\left(1.1\right)$? Explain your reasoning.

(c) Find the particular solution $y = f\left(x\right)$ with the initial condition $f\left(1\right) = 2$.

AP Calculus AP 2009 #5 No Calculator

x	2	3	5	8	13
$f\left(x\right)$	1	4	-2	3	6

Let *f* be a function that is twice differentiable for all real numbers. The table above gives values of *f* for selected points in the closed interval $2 \le x \le 13$.

(a) Estimate $f'\left(4\right)$. Show the work that leads to your answer.

(b) Evaluate $\int_2^{13}\left(3-5f'\left(x\right)\right)dx$. Show the work that leads to your answer.

(c) Use a left Riemann sum with subintervals indicated by the data in the table to approximate $\int_2^{13} f\left(x\right)dx$. Show the work that leads to your answer.

(d) Suppose that $f'\left(5\right) = 3$ and $f''\left(x\right) < 0$ for all *x* in the closed interval $5 \le x \le 8$. Use the line tangent to the graph of *f* at $x = 5$ to show that $f\left(7\right) \le 4$. Use the secant line for the graph of *f* on $5 \le x \le 8$ to show that $f\left(7\right) \ge \frac{4}{3}$

AP Calculus AB 2006 #5 No Calculator

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

(a) On the axes provided, sketch a slope field for the given differential equation at the eight points indicated.

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